MODEL 6252
FREQUENCY COUNTER

SERIAL NO.

Ⓐ

SYSTRON DONNER

Concord Instrument Division

INSTRUCTION MANUAL

MODEL 6252
FREQUENCY COUNTER

SERIAL NO.

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SYSTRON DONNER CORPORATION

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SYSTRON DONNER
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REPAIRS

Whenever a Systron-Donner instrument requires service, the nearest Systron-Donner representative should be contacted; all representatives will provide immediate service or arrange factory returns when necessary.

Please specify both model and serial number in all correspondence concerning Systron-Donner instruments. Address all inquiries on operation or applications to your nearest sales representative; or, Sales Manager, Concord Instrument Division, Systron-Donner Corporation, 10 Systron Drive, Concord, California 94518.

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CHAPTER 1
GENERAL INFORMATION

1.1 INTRODUCTION

The Model 6252 Frequency Counter is a 500 MHz Counter which features the Systron-Donner half rack design and a highly readable seven-segment display. An eight-digit readout is standard and includes a leading zero suppression feature for error free readings. Optional rear panel BCD output in parallel 8-4-2-1 format includes eight digits of numerical information, decimal point placement, and measurement units. Other options include operation by an internal, rechargeable battery or by an external dc voltage source. A level meter, coupled to the RF input, provides a visible display of proper signal level to the operator. If an overload is connected to the input, an overload relay is actuated providing electrical protection for the RF input circuitry.

Light weight, portability, and highly accurate direct readings combine to make this instrument a valuable addition for laboratory or field use.

1.2 SPECIFICATIONS

TABLE 1.1 SPECIFICATIONS

FREQUENCY MEASUREMENT	
DIRECT	
Range:	20 Hz to 50 MHz
Resolution:	1 Hz to 1 kHz selectable in decade steps
Display:	kHz with autopositioned decimal point
Accuracy:	±1 count ±time base accuracy
PRESCALE	
Range:	25 MHz to 512 MHz
Resolution:	1 Hz to 1 kHz selectable in decade steps
Display:	kHz with autopositioned decimal point

TABLE 1.1 SPECIFICATIONS (Cont'd)

PRESCALE Cont'd	
Accuracy:	±1 count ±time base accuracy
Prescale Ratio:	10:1
X 100 MULTIPLIER	
Range:	1 kHz to 10 kHz
Resolution:	0.01 Hz to 0.1 Hz
Display	Hz with autopositioned decimal point
Accuracy:	±2 counts ±time base accuracy
X 1000 MULTIPLIER	
Range:	50 Hz to 1 kHz
Resolution:	0.001 Hz or 0.01 Hz
Display:	Hz with autopositioned decimal point
Accuracy:	±2 counts ±time base accuracy
STANDARD TIME BASE	
Aging Rate:	$<\pm 3$ parts in 10^7/month
Temperature Stability:	$<\pm 5$ parts in 10^6 from 0°C to 50°C $<\pm 2$ parts in 10^6 from 20°C to 40°C, typical
Line Voltage:	$<\pm 1$ part in 10^7 for 10% line variation
External Input:	1 MHz at 1 volt rms into 1 kΩ
GENERAL	
Readout:	Eight digits plus off-scale indicator for register overflow. kHz and Hz indicator, overload indicator for prescale input.
Display Storage:	Holds reading between samples

TABLE 1.1 SPECIFICATIONS (Cont'd)

GENERAL Cont'd	
Sensitivity: (Direct and Multiplier Input)	25 mV rms with variable attenuator
Impedance:	One megohm and 25 pF
Prescale Input:	-13 dbm to +20 dbm with relative level indicator and overload cutout
Impedance:	50 Ω nominal
Power:	100-115 or 200-230 V ac ±10% 48-440 Hz, 17 W
Dimensions:	3 1/2" H X 8 3/8" W X 13 1/2" D
Weight:	10 lbs, (4.5 kg) net: 17 lbs (7.7 kg) shipping

1.3 OPTIONS

The Options listed in Table 1.2 are standard options available on the instrument.

TABLE 1.2 STANDARD OPTIONS

Option	Description
06	Internally mounted Battery Pack with built-in recharging circuit. Approximate four hour operating cycle.
07	DC Operation - Permits operation from an external dc power source.
08	Time Base Oscillator - Improves time base termperature stability to ±1 parts in 10^6 from 0 to 50°C.
09	Time Base Oscillator - Improves time base temperature stability to ±1 part in 10^7 from 0 to 50°C.
*11	Time Base Oscillator - Aging Rate ±3 parts in 10^9 per day. Temperature Stability ±1 part in 10^8, 0 to 50°C.

TABLE 1.2 STANDARD OPTIONS (Cont'd)

Option	Description
*12	Time Base Oscillator - Aging Rate ±1 part in 10^9 per day. Temperature Stability ±1 part in 10^8, 0 to 50°C.
*13	Time Base Oscillator - Aging Rate ±5 parts in 10^{10} per day. Temperature Stability ±1 part in 10^8, 0 to 50°C.
Rack Mounting	Provides for rack mounting the instrument in either half rack, full rack, or dual mount installation.
	* Not available when Options 06, 07 installed.

CHAPTER 2
INSTALLATION

2.1 INTRODUCTION

The S-D Model 6252 Frequency Counter is shipped in an operational condition and is essentially ready for use as received. This chapter outlines the procedures for initial inspection and installation of the instrument. Instructions for reshipment are also included should the unit be returned to Systron-Donner Corporation for service or repair.

2.2 RECEIVING INSPECTION

Prior to accepting the counter from the shipper, inspect the condition of the shipping container for any indication of freight damage. Any sign of such damage must be noted by both the shipper and receiver and should be reported to the insurance investigator.

Immediately following removal of the instrument from the shipping carton, inspect for possible physical damage incurred during shipment. Check surfaces for scratches or dents and note condition of controls and connectors. Should any damage be noted, notify your nearest Systron-Donner representative---DO NOT USE THE COUNTER UNTIL INSTRUCTED TO DO SO BY THE REPRESENTATIVE.

2.3 RESHIPMENT

When the instrument is to be repackaged for shipment use the original packing materials. Your Systron-Donner field office can provide materials similar to those used for the original factory packaging, or repackage the instrument following these general instructions:

GENERAL PACKING INSTRUCTIONS

1) Attach a tag to the unit indicating the model number, serial number, name and address of the instrument owner, and a summary of the service or repairs required.

2) Wrap the instrument in heavy paper or plastic prior to placing it into the shipping container.

3) Select a strong carton or wooden box to house the instrument.

4) Use an adequate layer of shock-absorbing material on all sides of the instrument and protect the front panel with additional layers of cardboard. Be certain that there is no movement of the unit within the container.

5) Seal the package with strong tape or metal bands.

6) Mark the shipping container "FRAGILE - DELICATE INSTRUMENT" to ensure careful handling.

7) Be certain that all correspondence refers to full instrument nomenclature, model, and serial number.

2.4 POWER REQUIREMENTS

The Model 6252 Frequency Counter is supplied with a standard three-conductor power cord which, when plugged into an appropriate power receptacle, grounds the chassis to protect operating personnel from certain electrical hazards. Whenever the power cord is mated to a two-conductor outlet, a cord adapter plug (properly installed) will provide the same protection.

The instrument operates from either 100, 115, 200, or 230 V at 48 to 440 Hz and consumes approximately 17 W of power. Taps on the primary of the power transformer are provided to accommodate these power line requirements. See drawing #053262 and #05315801 for location of the jumpers used for the various line voltage levels.

Check to assure the proper fuse is installed prior to applying power to the instrument. A 0.5 ampere fuse is required for 100-115 V operation and a 0.25 ampere fuse for 200-230 V operation.

CHAPTER 3
OPERATION

3.1 INTRODUCTION

This operational description of the Model 6252 Frequency Counter includes a functional description of the front and rear panel controls, connectors, and indicators, along with a step-by-step operating procedure.

3.2 FRONT PANEL FUNCTIONS

The following table describes the controls, connectors, and indicators on the front panel of the instrument. Location of the controls, connectors, and indicators is shown in Figure 3.1.

TABLE 3.1 FRONT PANEL FUNCTIONS

Index	Name	Function
1	POWER	This push-on push-off switch applies power to the instrument in either ac or battery operation. It also charges the battery when Option 06 is installed.
2	RESOLUTION HERTZ	This interlocked set of four pushbutton switches select the desired resolution.
	1000*	When depressed, this pushbutton switch selects 1 kHz resolution when either the 20 Hz-50 MHz or the 25 MHz-512 MHz frequency is selected. Ineffective in the TONE RANGE.
	100*	When depressed, this pushbutton switch selects 100 Hz resolution when either the 20 Hz-50 MHz or the 25 MHz-512 MHz frequency is selected. Ineffective in the TONE RANGE.
	10	When depressed, this pushbutton switch selects 10 Hz resolution if either the 20 Hz-50 MHz or the 25 MHz-512 MHz frequency is selected. Selects 0.001 Hz resolution when the 50 Hz-1 KHz TONE RANGE is selected and 0.01 Hz resolution when the 1 KHz-10 KHz TONE RANGE is selected.

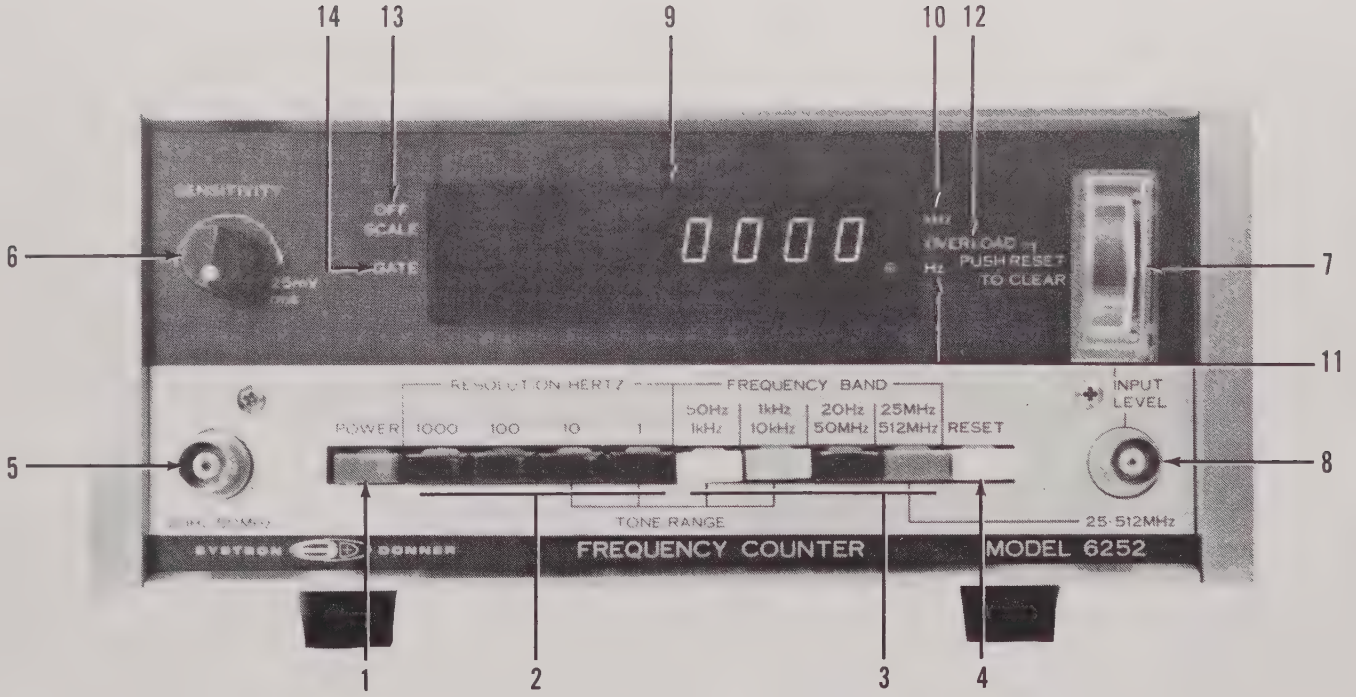

FIGURE 3.1 FRONT PANEL CONTROL AND INDICATORS

TABLE 3.1 FRONT PANEL FUNCTIONS (Cont'd)

Index	Name	Function
	1	When depressed, this pushbutton switch selects 1 Hz resolution if either the 20 Hz-50 MHz or the 25 MHz-512 MHz frequency is selected. Selects 0.001 Hz resolution when the 50 Hz-1 KHz TONE RANGE is selected and 0.01 Hz resolution when the 1 KHz-10 KHz TONE RANGE is selected.
	* If either 50 Hz-1 kHz or 1 kHz-10 kHz is selected in the FREQUENCY BAND, the instrument will not operate when the 1000 or 100 resolution switch is depressed.	
3	FREQUENCY BANDS	This interlocked set of four pushbutton switches selects the desired frequency range.
	50 Hz-1 KHz	Selects the 20 Hz-50 MHz input BNC connector. Provides a X1000 multiplication for input signals between 50 Hz and 1 kHz. Resolution switch 10 or 1 must be activated in this mode.
	1 KHz-10 KHz	Selects the 20 Hz-50 MHz input BNC connector. Provides a X100 multiplication of input signals between 1 kHz and 10 kHz. Resolution switch 10 or 1 must be activated in this mode.
	20 Hz-50 MHz	Selects the 20 Hz-50 MHz input BNC connector. Provides a direct count of input signals between 20 Hz and 50 MHz. Any resolution may be selected in this mode.
	25 MHz-512 MHz	Selects the 25 MHz-512 MHz input BNC connector. Provides a prescaled count of input frequencies between 25 MHz and 512 MHz. Any resolution may be selected in this mode.
4	RESET	This momentary pushbutton switch, when depressed, will set all indicators and control functions to their zero state. When the switch

TABLE 3.1 FRONT PANEL FUNCTIONS (Cont'd)

Index	Name	Function
4	RESET (Cont'd)	is released, a new sample will commence. When an OVERLOAD condition results from excessive signal input amplitude on the 25 MHz-512 MHz band, the RESET switch must be depressed to return the instrument to operation.
5	20 Hz-50 MHz (Connector)	This BNC connector accepts signals between 20 Hz and 50 MHz when any FREQUENCY BAND except 25 MHz-512 MHz is selected.
6	SENSITIVITY	This potentiometer provides a variable input attenuation to signals applied to the 20 Hz-50 MHz input connector. Maximum attenuation is obtained in the full counterclockwise position.
7	INPUT LEVEL	This meter provides a relative input level indication on the 25 MHz-512 MHz FREQUENCY BAND. Input amplitude is within acceptable limits when the meter reads in the green portion of the dial.
8	25 MHz-512 MHz (Connector)	This BNC connector accepts signals between 25 MHz and 512 MHz when the 25 MHz-512 MHz FREQUENCY BAND is selected.
9	Readout/Digits	These seven-segment, eight-digit, readout tubes display the measurement data with decimal point.
10	Readout/kHz	This LED indicator, when lit, shows the measurement to be in kHz as read from the decimal point. Will light when either the 20 Hz-50 MHz or 25 MHz-512 MHz range is selected.
11	Readout/Hz	This LED indicator, when lit, shows the measurement to be in Hertz when read from the decimal point.
12	Readout/OVERLOAD	This LED indicator, when lit, shows that a signal amplitude exceeding +20 dbm has been applied to the

TABLE 3.1 FRONT PANEL FUNCTIONS (Cont'd)

Index	Name	Function
12	Readout/OVERLOAD (Cont'd)	25 MHz-512 MHz input connector. This is a latching indication and must be cleared by first removing the overload and then depressing the RESET switch.
13	Readout/OFF SCALE	This LED indicator lights when the readout exceeds 99999.999.
14	Readout/GATE	This LED indicator flashes showing the opening and closing of the gate.

3.3 REAR PANEL FUNCTIONS

The following table describes the controls and connectors on the rear panel of the instrument. Location of the controls and connectors is shown in Figure 3.2.

TABLE 3.2 REAR PANEL FUNCTIONS

Index	Name	Function
1	AC RECEPTACLE	This connector socket allows connection of the ac power to operate the counter.
2	EXT VDC + 6/12 V -	These are the connectors for an external battery when Option 07 is installed.
3	1 MHz INT/EXT	This slide switch selects either the INTernal time base or an EXTernal time base applied to the 1 MHz IN, BNC connector.
4	1 MHz EXT	This BNC connector provides for an external 1 MHz time base input when the INT/EXT switch is in the EXTernal position.
5	OSC ADJ	These controls allow coarse and fine adjustment of the oscillators.
6	Fuse Holder	0.5 amp fuse for 100-115 V and 0.25 amp fuse for 200-230 V operation.
7	Cover Plate	Optional BCD output.

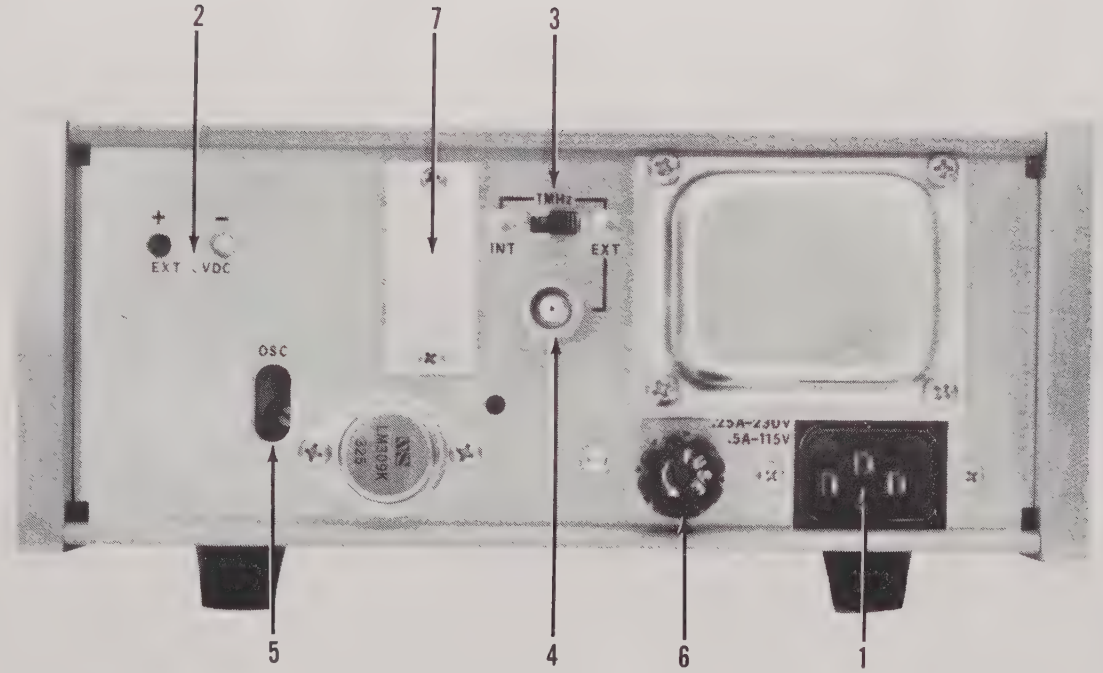

FIGURE 3.2 REAR PANEL CONTROLS AND CONNECTORS

3.4 OPERATING PROCEDURES

There are four selectable bands of frequencies which may be measured by the Model 6252. The 20 Hz-50 MHz input BNC connector is the input for the 20 Hz-50 MHz band, the 50 Hz-1 KHz band, and the 1 KHz-10 KHz band. The 20 Hz-50 MHz band provides direct measurement of the input frequency. The 50 Hz-1 KHz band provides a X1000 multiple of the input frequency when either the 1 Hz or 10 Hz resolution is selected. The 1 KHz-10 KHz band provides a X100 multiple of the input frequency when either the 1 Hz or 10 Hz resolution is selected. The 25 MHz-512 MHz band prescales the input frequency by a ratio of 10 prior to the measurement. In all bands, the indication on the display will be a direct readout.

3.4.1 20 Hz-50 MHz FREQUENCY BAND

To measure the frequency of a signal in this band set the counter controls as follows:

Front Panel

POWER	Depress on
FREQUENCY BAND	Depress the 20 Hz-50 MHz switch.
RESOLUTION	Depress either the 1, 10, 100, or 1000 switch.
RESET	Depress and release
SENSITIVITY	Full counterclockwise; Rotate clockwise until a stable reading is obtained.
Signal Input	Connect to the 20 Hz-50 MHz BNC connector.

Rear Panel

INT/EXT	Set this switch to INT for operation on the internal time base of the counter or set the switch to EXT for external time base operation.
1 MHz EXT	Connect an external time base, 1 MHz, 1 V rms into 1000 Ω, to this BNC when using the EXT switch position.
EXT VDC	Connect an external battery to the + and - EXT terminals, when battery operation is required and the 07 DC Operation Option is installed.

3.4.2 1 KHz-10 KHz FREQUENCY BAND

To measure the frequency of a signal in this band set the counter controls as follows:

Front Panel

POWER	Depress on
FREQUENCY BAND	Depress the 1 KHz-10 KHz switch.
RESOLUTION	Depress either the 1 or 10 switch. (The 100 and 1000 switches are inoperative in the 1 KHz-10 KHz band.)
RESET	Depress and release
SENSITIVITY	Full counterclockwise; Rotate clockwise until a stable reading is obtained.
Signal Input	Connect to the 20 Hz-50 MHz BNC connector.

Rear Panel

INT./EXT.	Set this switch to INT for operation on the internal time base of the counter or set switch to EXT for external time base.
1 MHz EXT	Connect an external time base, 1 MHz, 1 V rms into 1000 Ω, to this BNC when using the EXT switch position.
EXT VDC + 6/12 V -	Connect an external battery to the + and - EXT terminals when battery operation is required and the 07 DC Operation Option is installed.

3.4.3 50 Hz-1 KHz FREQUENCY BAND

To measure the frequency of a signal in this band set the counter controls as follows:

Front Panel

POWER	Depress on
FREQUENCY BAND	Depress 50 Hz-1 KHz switch.
RESOLUTION	Depress either the 1 or 10 switch. (The 100 and 1000 switches are inoperative in the 50 Hz-1 KHz band.)

RESET	Depress and release
SENSITIVITY	Full counterclockwise; Rotate clockwise until a stable reading is obtained.
Signal Input	Connect to the 20 Hz-50 MHz BNC connector.

Rear Panel

INT./EXT.	Set this switch to INT for operation on the internal time base of the counter or set switch to EXT for external time base.
1 MHz EXT	Connect an external time base,1 MHz, 1 V rms into 1000 Ω, to this BNC when using the EXT switch position.
EXT VDC + 6/12 V -	Connect an external battery to the + and - EXT terminals when battery operation is required and the 07 DC Operation Option is installed.

3.4.4 25 MHz-512 MHz FREQUENCY BAND

To measure a signal frequency in this band set the counter controls as follows:

Front Panel

POWER	Depress on
FREQUENCY BAND	Depress the 25 MHz-512 MHz switch.
RESOLUTION	Depress either the 1, 10, 100, or 1000 switch.
RESET	Depress and release
Signal Input	Connect to the 25 MHz-512 MHz BNC connector.
INPUT LEVEL	Adjust amplitude of the input signal until the meter reads in the green area. (If an overload condition exists, the OVERLOAD indicator will light and the relay will disconnect the input from the circuit.)

Front Panel (Cont'd)

OVERLOAD	If the OVERLOAD indicator is lit, the input signal amplitude exceeds +20 dbm. Reduce the amplitude of the input signal and depress and release the RESET switch.

Rear Panel

INT./EXT.	Set this switch to INT for operation on the internal time base of the counter or set switch to EXT for external time base.
1 MHz EXT	Connect an external time base, 1 MHz, 1 V rms into 1000 Ω, to this BNC when using the EXT switch position.
EXT VDC + 6/12 V -	Connect an external battery to the + and - EXT terminals when battery operation is required and the 07 DC Operation Option is installed.

CHAPTER 4
MAINTENANCE

4.1 INTRODUCTION

This chapter contains procedures for maintenance and calibration of the Model 6252 to aid the user in maintaining the instrument in proper operating condition. Whenever a Systron-Donner instrument requires service, the nearest SD representative should be contacted. He can provide field service, or arrange factory returns, when necessary. Address all inquiries on operation or application to your nearest sales representative; or, Sales Manager:

SYSTRON-DONNER CORPORATION
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10 Systron Drive
Concord, California 94518
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Specify both model and complete serial number in all correspondence.

4.2 TEST EQUIPMENT

Test equipment recommended for maintaining and checking performance is listed in Table 4.1. Equivalent test equipment having similar characteristics may be substituted when necessary.

TABLE 4.1 RECOMMENDED TEST EQUIPMENT

Type	Characteristic	Recommended Type
Digital Voltmeter	0.1% dc - 1% ac	SD Model 7004A
Signal Generator	10 Hz to 10 MHz	HP Model 651B
Signal Generator	10 MHz to 480 MHz	HP Model 608C
Signal Generator	450 MHz to 1200 MHz	HP Model 612A
Frequency Standard	1 MHz Output	General Technology Model 304B

4.3 PERFORMANCE VERIFICATION

Operation and performance of all circuits in the frequency counter can be verified by the following procedures:

4.3.1 20 Hz-50 MHz Test

1) Set the Counter controls:

RESOLUTION	Depress 1
FREQUENCY BANDS	Depress 20 Hz-50 MHz
SENSITIVITY	Maximum clockwise
INT/EXT	INT

2) Connect the 10 MHz to 480 MHz signal generator to the 20 Hz-50 MHz BNC connector on the Counter. Adjust the signal generator for an output of 50 MHz at 25 mV rms. Observe the display is 50000.000 kHz to generator accuracy.

3) Vary the output frequency of the signal generator in a random manner from 50 MHz to 10 MHz. Maintain the signal level at 25 mV rms. Observe the proper indication in the display.

4) Depress the RESET switch and observe that the display resets to zero.

5) Connect the 10 Hz to 10 MHz signal generator and repeat 3) using signals from 20 Hz to 10 MHz.

4.3.2 1 KHz-10 KHz Test

1) Set the Counter controls:

RESOLUTION	Depress 10
FREQUENCY BANDS	Depress 1 KHz-10 KHz switch
SENSITIVITY	Maximum clockwise
INT/EXT	INT

2) Connect the 10 Hz to 10 MHz signal generator to the 20 Hz-50 MHz BNC connector. Adjust the signal generator for an output of 1 kHz, 100 mV rms. Observe the display is 1000.000 Hz to generator accuracy.

3) Vary the signal generator frequency from 1 kHz to 10 kHz, maintain 100 mV rms, and note the proper indication on the display.

4) Set the signal generator to a frequency of 25 kHz. Note the indication is zero.

4.3.3 50 Hz-1 KHz Test

1) Set the Counter controls:

RESOLUTION	Depress 1
FREQUENCY BANDS	Depress 50 Hz-1 KHz switch
SENSITIVITY	Maximum clockwise
INT/EXT	INT

2) Connect the 10 Hz to 10 MHz signal generator to the 20 Hz-50 MHz BNC connector. Adjust the signal generator output to 1 kHz, 100 mV rms. Observe the display is 1000.000 Hz to generator accuracy.

3) Vary the signal generator frequency from 1 kHz down to 50 Hz, maintain 100 mV rms, and note the proper indication on the display.

4) Set the signal generator frequency to 2.5 kHz. Note the indication is zero.

5) Remove the signal generator from the input connector. Note the indication remains at zero.

4.3.4 25 MHz-512 MHz Test

1) Set the Counter controls:

RESOLUTION	Depress 1000
FREQUENCY BANDS	Depress 25 MHz-512 MHz switch

2) Connect the 10 MHz to 480 MHz signal generator to the 25 MHz-512 MHz BNC connector. Adjust the signal generator to 25 MHz, -13 dbm amplitude. Note that the display indication is 25000 kHz, and the input LEVEL METER is in the green.

3) Vary the signal generator frequency from 25 MHz to 480 MHz, maintaining -13 dbm amplitude, and note the proper display indication. The LEVEL METER remains in the green portion of the dial.

4) Connect the 450 MHz to 1200 MHz signal generator to the 25 MHz-512 MHz BNC connector. Adjust the signal generator to 450 MHz, -13 dbm amplitude. Note that the display indicates 450000 kHz to generator accuracy.

5) Vary the signal generator frequency from 450 MHz to 512 MHz maintaining -13 dbm amplitude and note the proper indication on the display.

6) With the signal generator frequency at 512 MHz, and an amplitude of -13 dbm, note that the LEVEL METER indicator is approximately at the line between the green and lower red areas of the scale.

7) At any frequency in the 25 MHz to 512 MHz band, apply a signal with an amplitude in excess of +20 dbm. Observe that the OVERLOAD indicator lights and the input meter drops to zero. Remove the overload input and depress and release the RESET switch. Note that the OVERLOAD indicator is no longer lit. Repeat 2) through 6).

4.3.5 External Standard Test

1) Set Counter controls as follows:

RESOLUTION	Depress 1
FREQUENCY BANDS	Depress 20 Hz-50 MHz
SENSITIVITY	Maximum clockwise
INT/EXT	INT

2) Connect the 10 Hz to 10 MHz signal generator to the 20 Hz-50 MHz BNC connector. Adjust the signal generator frequency to 1 MHz at 25 mV rms.

3) Connect a 1 MHz standard generator to the 1 MHz IN BNC connector on the rear panel.

4) Change the INT/EXT switch on the rear panel from INT to EXT. Observe no change in display.

4.4 ROUTINE MAINTENANCE

A regular program for maintenance and inspection every five to six months is recommended for this unit. As part of these regular procedures, the instrument should be checked in the following manner:

1) Disconnect ac power and remove the top and bottom covers.

2) Make a thorough visual inspection of all wiring and cables. Check for frayed, loose, or burned wires.

3) Check the physical integrity of all components. Look for burned or cracked components, loose solder connections, leakage of insulation compounds, and general physical damage. When a printed-circuit board contains integrated circuit packages, ensure that all packages are firmly mounted. Never unnecessarily remove and replace a package.

4) Check all front panel switches and controls for loose or broken terminals, loose or sticking shafts, etc.

5) If the internal panel surfaces and components have an excessive amount of dust deposited on them, use a soft brush and low-pressure stream of air to remove the foreign material.

CAUTION

Do not clean P.C. boards or small internal components with a stiff brush or solvents, since damage to the circuits may result. A high-powered vacuum cleaner device should not be used on small internal components.

6) Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints, and other foreign materials.

7) Replace the top and bottom covers and reconnect ac power. Check instrument performance in accordance with procedures given in Section 4.3. If performance does not match or exceed the specifications listed in Chapter 1 of this manual, corrective maintenance may be required.

4.5 PRINTED-CIRCUIT BOARD REPAIR

When replacing integrated circuits or other electronic components soldered to printed-circuit boards, the procedures indicated below must be followed or damage to the board may result:

1) Determine by troubleshooting techniques, which integrated circuit or discrete component(s) has failed.

2) Remove the defective component(s) from the board by cutting the pins or leads with a small diagonal clipping tool. (Always remove and replace the entire component).

3) Apply heat (40-50 W soldering iron) sparingly to each of the cut pins or leads and remove from the board; clean the hole(s) with a toothpick or solder suction tool.

4) Form the tinned leads of the replacement part and insert in the printed-circuit holes; solder, then trim leads to extend 1/16-inch beyond the back surface of the board. (Use only 63-37 solder with maximum 1/16-inch diameter.)

CAUTION

Always trim semiconductor leads only after soldered installation is complete. This procedure greatly lessens the possibility of component failure due to shock-wave damage caused by the trimming tool.

5) When soldering semiconductor devices and all small components, be sure to use a heat sink tool or long-nosed plier connected to the component lead(s) while each is being soldered. Allow the soldered connection to cool before removing the heat sink.

6) Clean all dirt and solder-flux from the printed circuit traces by liberal application of isopropyl alcohol or freon-type solvents.

4.6 CALIBRATION

4.6.1 Amplifier Adjustment, A3

1) Set controls:

SENSITIVITY	Maximum clockwise
RESOLUTION	Depress 1000
FREQUENCY BANDS	Depress 20 Hz-50 MHz

2) With the digital voltmeter, monitor TP1 on the amplifier.

3) Adjust BIAS, R7, for a reading of +2 V dc ±100 mV.

4) Connect the 10 MHz to 480 MHz generator to the 20 Hz-50 MHz BNC connector. Adjust the signal generator to a frequency of 50 MHz at 100 mV rms. Observe 50000 kHz on the display.

5) Decrease input signal amplitude and adjust the trigger level (T.L.) control, R25, until the best sensitivity is obtained. This should be a signal amplitude of approximately 20 mV rms.

4.6.2 Prescaler Adjustment, A4

1) Set controls:

RESOLUTION	Depress 1000
FREQUENCY BANDS	Depress 25 MHz-512 MHz switch

2) Connect the 450 MHz to 1200 MHz signal generator to the 25 MHz-512 MHz BNC connector. Adjust the signal generator to an output of 512 MHz (dial accuracy) at -13 dbm amplitude.

3) Adjust the METER ZERO, R12, on the Prescaler so the LEVEL METER pointer rests on the dividing line between the green section and the lower red section of the meter scale.

4) Adjust the signal generator frequency to any frequency in the 25 MHz-512 MHz band and adjust the signal amplitude to +20 dbm.

5) Adjust the OVERLOAD SET control on the Prescaler until the OVERLOAD light comes on.

6) Depress the RESET switch and note the light remains on.

7) Reduce the input amplitude and depress the RESET switch, note the OVERLOAD light is no longer lit.

4.6.3 Oscillator Adjustment, A5

1) Set controls:

RESOLUTION	Depress 1
FREQUENCY BANDS	Depress 20 Hz-50 MHz switch

2) Connect the 1 MHz frequency standard to the 20 Hz-50 MHz BNC connector.

3) Adjust the OSC ADJ on the rear panel for a reading of 1000000 Hz ±1 count.

4) As an alternate method of adjusting the oscillator, connect the 1 MHz frequency standard to the external sync of the oscilloscope.

5) Connect the vertical input of the oscilloscope to terminal 28 on the Logic board, A1. Adjust C1 for a drift of 1 cycle per second or less, on the oscilloscope display.

4.6.4 Amplifier, A3, R1 Selection Procedure

1) Set controls:

SENSITIVITY	Maximum counterclockwise
RESOLUTION	Depress 1000
FREQUENCY BANDS	Depress 20 Hz-50 MHz

2) With a suitable jumper, short across R1.

3) Connect the 10 Hz to 10 MHz signal generator to the 20 Hz-50 MHz BNC connector. Adjust the signal generator to a frequency of 1 kHz at 300 mV peak-to-peak.

4) Connect the oscilloscope to the junction of R4 and R5.

5) Rotate R2, SENSITIVITY, slowly clockwise and note the amplitude increase indicated on the oscilloscope. Continue

the rotation of R2 until the amplitude no longer increases.

6) With R2 at the point where signal amplitude no longer increases, measure the dc voltage on the wiper arm of R2.

7) Rotate R2 maximum clockwise.

8) Remove the short across R1. Select a resistor value to give the same dc voltage reading at the wiper arm of R2 as was obtained in 6) above.

CHAPTER 5
PRINCIPLES OF OPERATION

5.1 INTRODUCTION

The Model 6252 is an integrated-circuit, frequency counter that measures the frequency of a signal. The measuring techniques compare the frequency of an unknown signal to a time base derived from a reference frequency.

Figure 5.1 is a functional block diagram of the instrument. The system consists of front panel controls, input amplifier-shaper, prescaler, multiplier, function select logic, function control logic, time base, oscillator reference, decade counters, readout unit, and power supply. The frequency band switches on the front panel connect the appropriate circuit for the particular measuring function through the function select logic. The resolution switches select a time base reference signal. The combined condition of the two switches determine the proper decimal point placement and measurement unit indication in the readout.

When an unknown signal is connected to the instrument, the input amplifier-shaper converts the signal into a rectangular waveform. The rectangular waveform is converted into counting pulses that are directed to the decade counters,when the count gate is opened by the selected time base.

The serial data is converted into BCD format by the decade counters. Then the BCD data is decoded into decimal outputs by the decoder driver. The decoder driver drives seven-segment readout tubes that indicate the measurement, along with measurement unit indications, and decimal point placement. Display time of the measurement, independent of gate time, is fixed at approximately 100 μs. The readout unit continuously displays the most recent measurement at the end of each gate time.

5.2 LOGIC DEVICES

Schematic Logic Board P.C. Assembly, #05315801, contains a list of typical integrated circuit devices found in this instrument.

5.3 LOGIC SYMBOLS AND NOTATIONS

Since most of the integrated circuit modules used in this instrument are DTL/TTL compatible, most signal levels are 0.0 V to 0.8 V LOW (L) and +2.4 V to 5.0 V HIGH (H) (See Figure 5.2). The tables of combinations in Figure 5.3 show the functions for similar logic symbols. Of the two symbol forms which may be used to represent each table of combinations, the one on the left is normally used, but occasionally the inverted form is more descriptive of the circuit function.

A small circle(s) at the input(s) to any element indicates that the relatively low signal input activates the function. The absence of a circle indicates that the relatively high signal activates the function. A small circle at the output of a symbol indicates that the output terminal is low when the input logics have been satisfied.

The active state of a logic line is identified with the absence or inclusion of bar notation over the signal name. For example: RESET; indicates a high-level condition producing the active state of reset. $\overline{\text{RESET}}$; indicates a low-level condition producing the active state of reset. In general, an open line to a logic symbol is considered a HIGH.

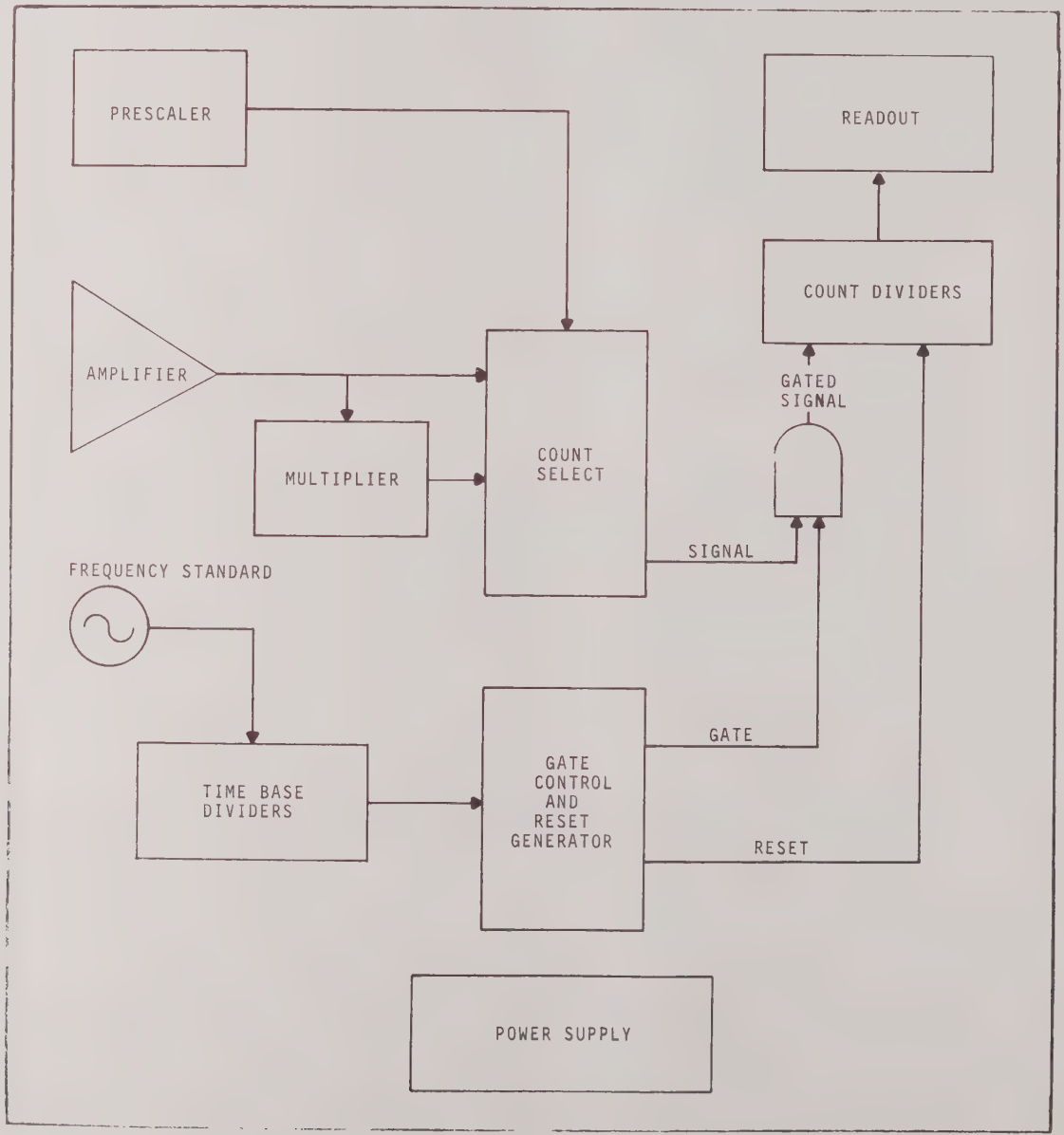


FIGURE 5.1 FUNCTIONAL BLOCK DIAGRAM

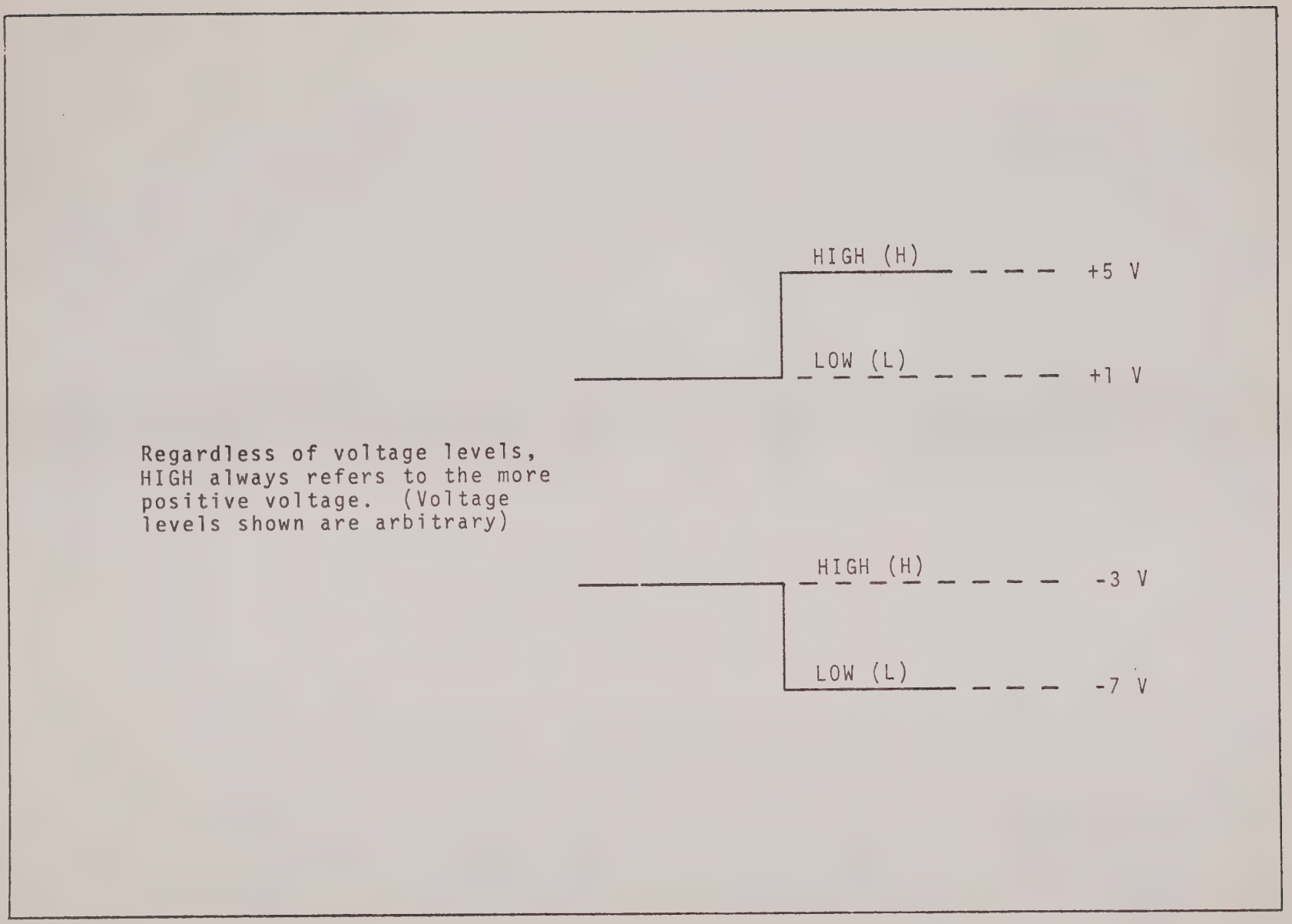


FIGURE 5.2 DEFINITIONS OF LOGIC LEVELS

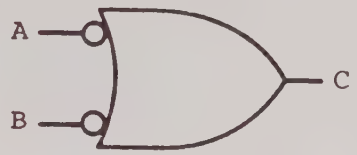
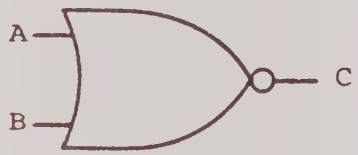
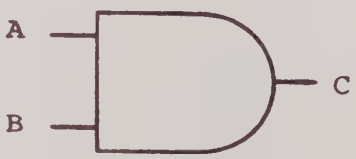
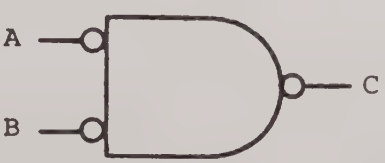
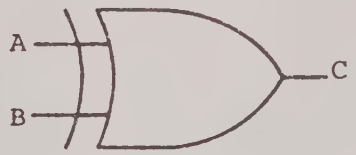
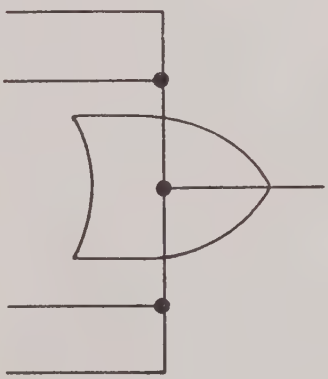
Truth Table	Normal Symbol	Inverted Symbol
A B C H H L H L H L H H L L H	NAND $A \cdot B = \overline{C}$	INV. OR  $\overline{A} + \overline{B} = C$
A B C H H L H L L L H L L L H	NOR  $A + B = \overline{C}$	INV. AND $\overline{A} \cdot \overline{B} = C$
A B C H H H H L L L H L L L L	AND  $A \cdot B = C$	INV. NOR $\overline{A} + \overline{B} = \overline{C}$
A B C H H H H L H L H H L L L	OR $A + B = C$	INV. NAND  $\overline{A} \cdot \overline{B} = \overline{C}$

FIGURE 5.3 TYPICAL CIRCUIT LOGIC SYMBOLS

Truth Table	Normal Symbol
A | B | C H | H | L H | L | H L | H | H L | L | L	EXCLUSIVE OR  $C = (A + B) \cdot (\overline{A \cdot B})$ $\overline{C} = (\overline{A + B}) + (A \cdot B)$

DOT OR



DOT AND

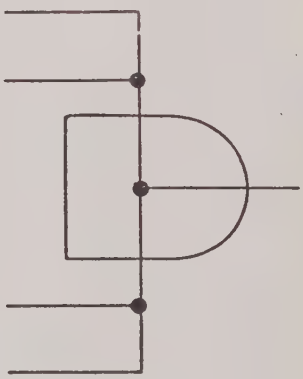


FIGURE 5.3 TYPICAL CIRCUIT LOGIC SYMBOLS (CONT'D)

CHAPTER 6

FUNCTIONAL DESCRIPTION

6.1 INTRODUCTION

Chapter 6 contains circuit descriptions, assembly and schematic drawings and parts lists for the Model 6252 Frequency Counter. Final assembly drawings and parts lists appear first, followed by the block diagram and circuit board sections in the order listed in Table 6.1. This manual may also contain revised or updated information reflecting certain changes in production requirements. This supplemental information will be located in Chapter 8.

6.2 DESCRIPTIONS AND DRAWINGS

Listed in Table 6.1, for reference purposes, is an index to final assembly and printed-circuit board drawings provided in this chapter.

TABLE 6.1 DRAWING INDEX INFORMATION

Ref	Description	Assembly #	Schematic #	Page #
	Rear Panel Assembly	053217	---	6-4
	Test Assembly	053262	---	6-5
	Model 6252 Block Diagram	---	7-053182	6-6
A1	Logic Board Assembly	05315801	7-05315801	A1-1
A2	Readout Assembly	45586-4-1	45586-7-1	A2-1
A3	Amplifier Assembly	05311301	7-05311301	A3-1
A4	Prescaler Assembly	05309001	7-05309001	A4-1
A5	Oscillator Assembly	05318301	7-05318301	A5-1

PARTS LIST

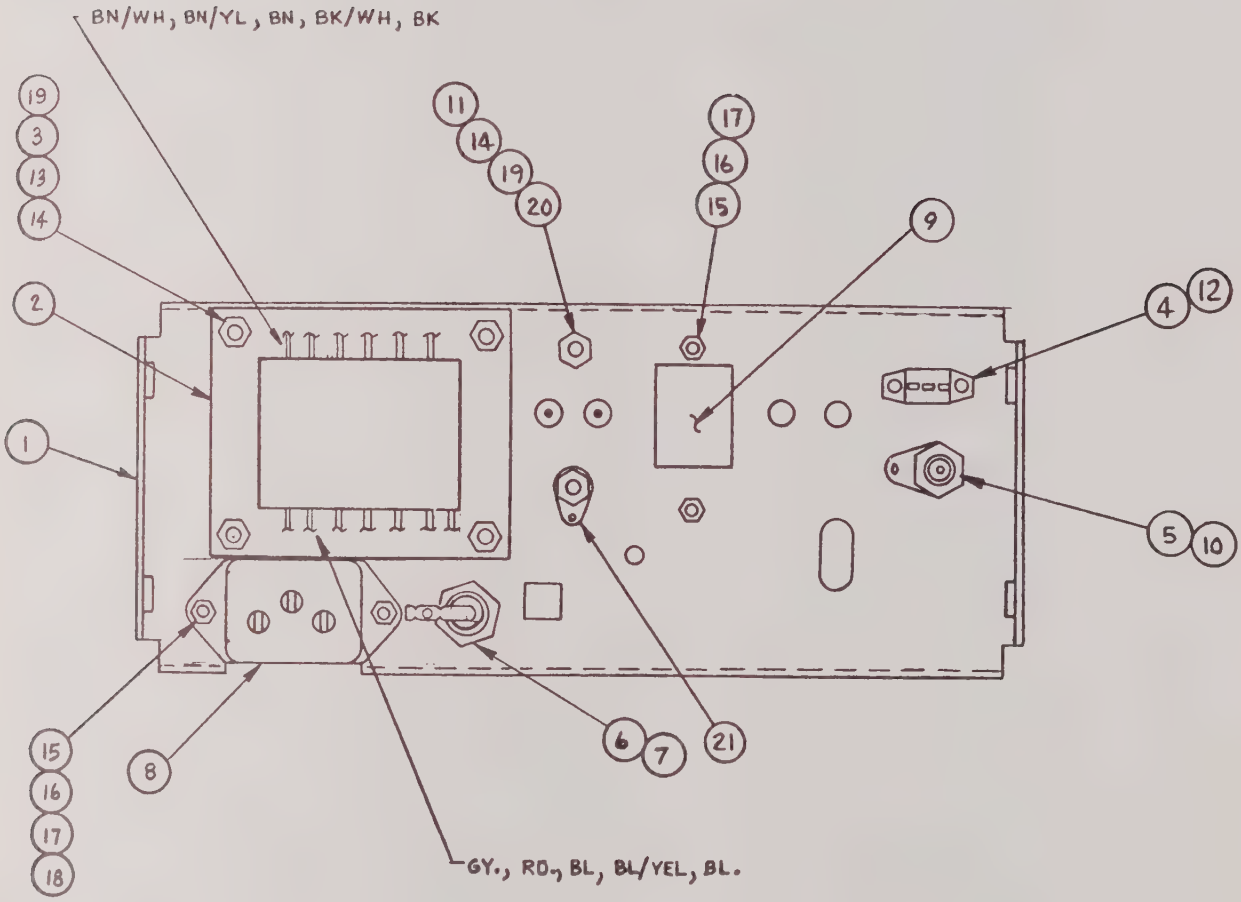
6252 FINAL ASSEMBLY #053182

Ref.	Description	SD Part No.	Qty.
1	Final Assembly	053182	
3	Block Diagram	7-053182	
5	Test Assembly	053262	1
7	Panel, decorative	053194	1
9	Window	04559361	1
11	Trim, front	03723061	2
13	Trim, side	03985903	2
15	Mounting bracket, cover	039857	2
17	Handle	03357003	2
19	Trim, end	039033	4
21	Cover, top	03356703	1
22	Cover, bottom, assembly	04506503	1
24	Cord, line	W0095	1
26	Nut, tinnerman, 6-32	H1907	4
27	Screw, 8-32 X 5/8, FHMS	H1733	8
28	Screw, 6-32 X 5/16, PHMS	H1281	6
29	Screw, 6-32 X 1/4, FHMS	H0430	4
30	Screw, 6-32 X 5/16, FHMS	H0287	2
31	Washer, #6 split	H0783	4
32	Cord, vinyl	H1902	A/R
33	Knob	H1881	1
34	Rack mount kit, single	04541003	
35	Rack mount kit, dual	03749203	
	Test Assembly	053262	
A1	Logic P.C. Assembly	05315801	1
A2	Readout P.C. Assembly	45586-4-1	1
A3	Amplifier P.C. Assembly	05311301	1
A4	Prescaler P.C. Assembly	05309001	1
A5	Oscillator P.C. Assembly	05318301	1
1	Rear Panel Assembly	053217	1
2	Sub panel, front	053099	1
4	Rail, right side	053115	1
5	Rail, left side	053116	1
10	Wrench, Allen	102824	1
Q3,Q4	Transistor, 2N5193	Q0300	2
12	Screw, 6-32 X 5/16, PHM	H1281	10
13	Screw, 4-40 X 5/16, PHM	H1273	15
14	Washer, #6 split lock	H0783	10
15	Washer, #6 flat	H0759	10
16	Washer, #4 split lock	H0782	4
17	Washer, #4 flat	H0758	4
18	Nut, #4 kep	H1872	8
19	Nut, #6	H0380	6

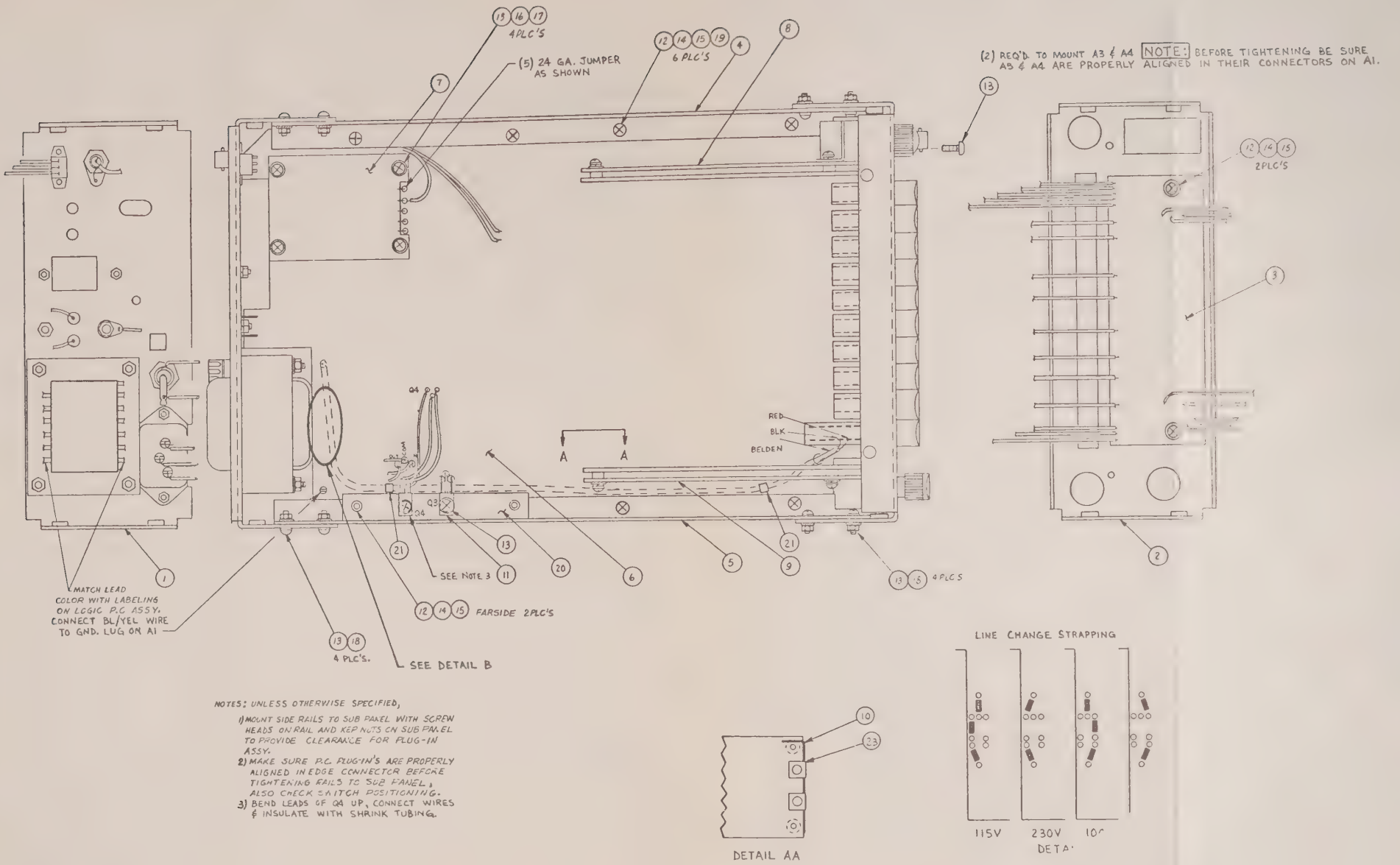
PARTS LIST

6252 FINAL ASSEMBLY #053182 (Cont'd)

Ref.	Description	SD Part No.	Qty.
20	Heat Sink	053189	1
21	Tie, cable	H1104	2
23	Tinnerman	H2110	2
	Rear Panel Assembly	053217	
1	Panel, rear	053126	1
2	Transformer	053191	1
3	Bell, end	04561761	1
4	Switch, slide, SPDT	S0356	1
5	Connector, BNC	J0165	1
6	Post, fuse	X0034	1
7	Fuse, 1/2 A, 3AG	F0044	1
8	Receptacle, ac	J0664	1
9	Plate, cover	02139811	1
10	Lug, ground, BNC	E0137	1
U1	Regulator, +5 V	025787	1
12	Rivet, .088 X 5/32 lg.	H1839	2
13	Screw, 6-32 X 1 1/2, PHM	H1286	4
14	Nut, hex, #6	H0380	4
15	Screw, 4-40 X 3/8, PHM	H0376	4
16	Nut, #4	H0249	4
17	Washer, #4 split lock	H0782	4
18	Washer, #4 flat	H0758	2
19	Washer, #6 split lock	H0783	6
20	Screw, 6-32 X 3/8, PHMS	H0989	2
21	Lug, Solder #6	E0118	1



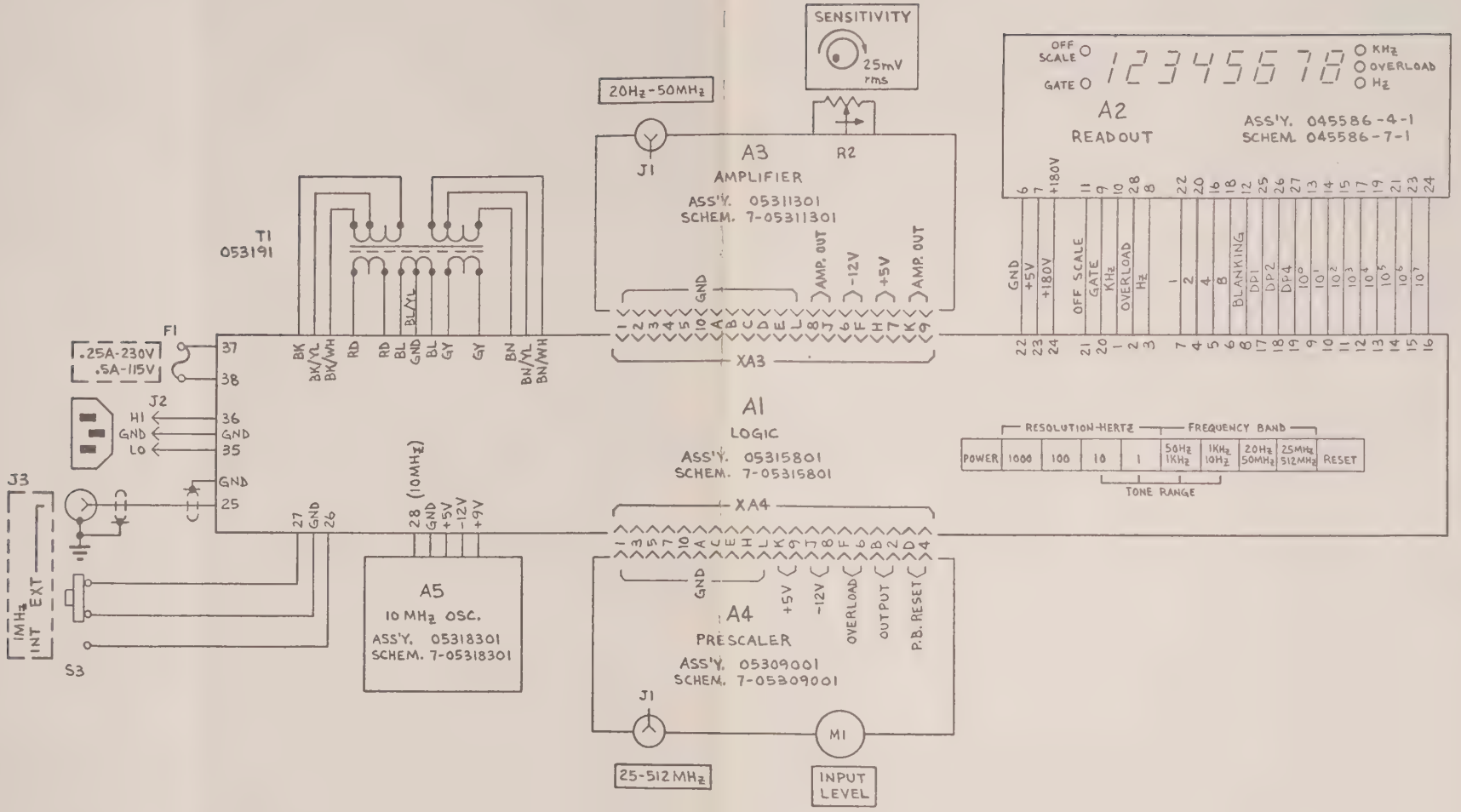
REAR PANEL ASSEMBLY #053217 REV B



NOTES: UNLESS OTHERWISE SPECIFIED,

1) MOUNT SIDE RAILS TO SUB PANEL WITH SCREW HEADS ON RAIL AND KEP NUTS ON SUB PANEL TO PROVIDE CLEARANCE FOR PLUG-IN ASSY.
2) MAKE SURE P.C. PLUG-IN'S ARE PROPERLY ALIGNED IN EDGE CONNECTOR BEFORE TIGHTENING RAILS TO SUB PANEL, ALSO CHECK SWITCH POSITIONING.
3) BEND LEADS OF Q4 UP, CONNECT WIRES & INSULATE WITH SHRINK TUBING.

TEST ASSEMBLY #053262 REV B



BLOCK DIAGRAM MODEL 6252
#7-053182 REV A

CIRCUIT DESCRIPTION
A1, LOGIC BOARD ASSEMBLY
SCHEMATIC #7-05315801

The Logic board assembly consists of ten major circuit groups; power supply, time base, control binaries count gate, control, zero suppression, decimal and legend logic, count chain, multiplex, off scale and gate light, and the frequency multiplier.

The power supply consists of line filters, L1, C1, L2, C2, transformer T1 and three full wave rectifiers, along with control and regulating circuitry. The dc outputs are +180 V, through Q1 regulator; +9 V is applied to regulator U1, Q3, to produce +5 V and -18 V is regulated through U2, Q4, for an output of -12 V.

Time base selection is accomplished by controlling the programmable divider chain, U31, containing six programmable decades. The 10 MHz frequency standard is divided by U3 to provide a 1 MHz clock frequency. The time base is selected by depressing the desired RESOLUTION and FREQUENCY BAND switches.

Control binaries, U32, U33, accept start-stop information from the time base divider, U31. The second section of U32 is the first binary of the count chain. This section is controlled by U32-5, while counting inputs from U22.

Recycling of the instrument is accomplished through the reset one-shot, U15, C21. The fixed recycle rate of the instrument is controlled by one-shot,U15, C20. The transfer one-shot, U16, C19, updates the display at each end-of-count signal.

Zero suppression is controlled by the most significant digit, and the decimal placement through U17, U18, U23, U27, U28, U29, and U30. As pin 13 of U37 through U44 is activated, a control line, internal to the circuit, provides a blanking code to the summed output lines.

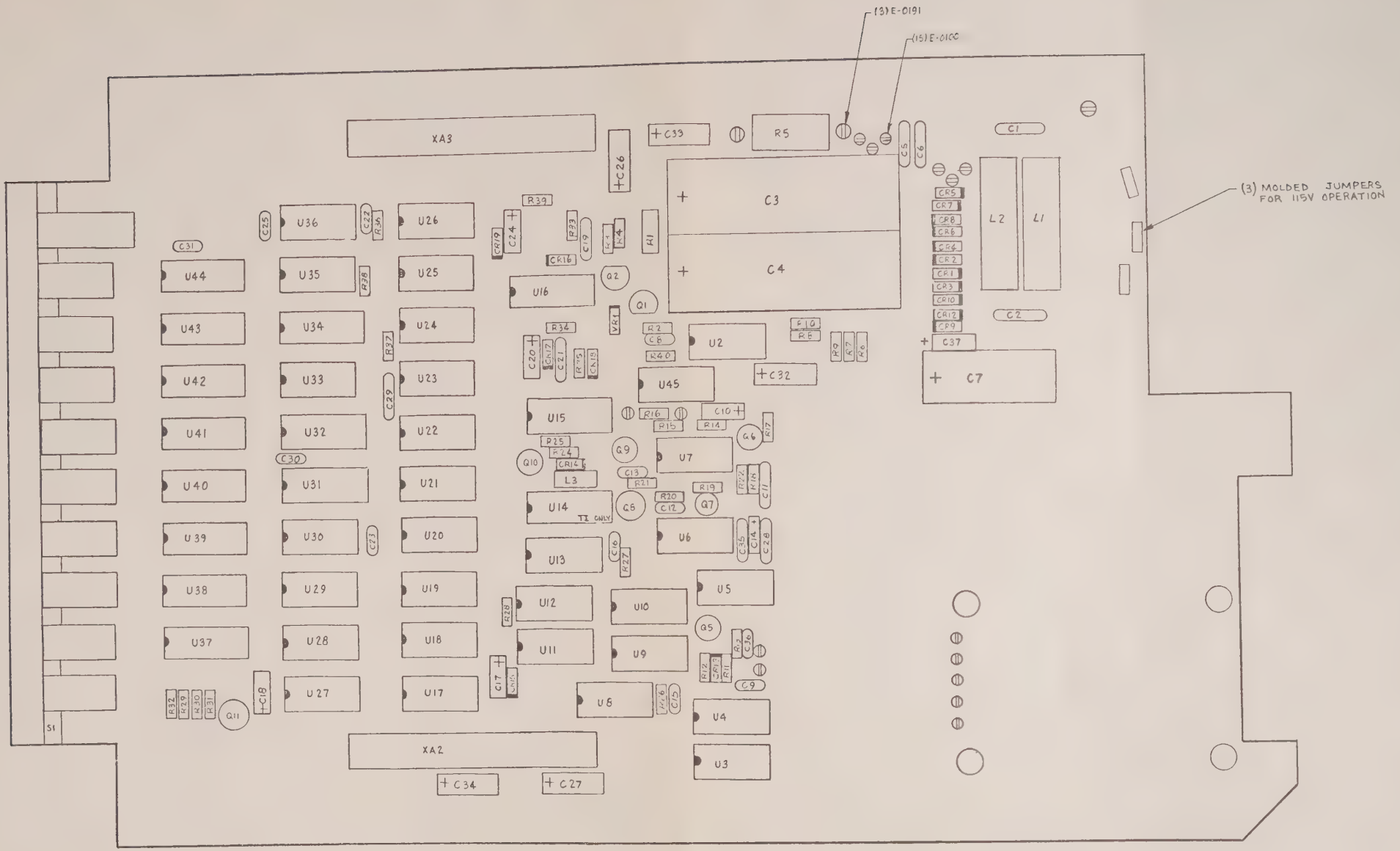
Decimal and legend information is selected by the resolution and band switches. The decimal information is sensed by U29,which provides the required drive for the decimal point indicators. Legend information is developed by U24 to drive the legend indicator.

The count chain consists of U32, U33, U37 through U41, and U44. U42 is the storage element and transfer for the high speed decade, U32, U33. U37 through U41, and U43, U44 are combined decade storage devices which can parallel outputs for multiplex purposes. Blanking code information is also contained in these devices.

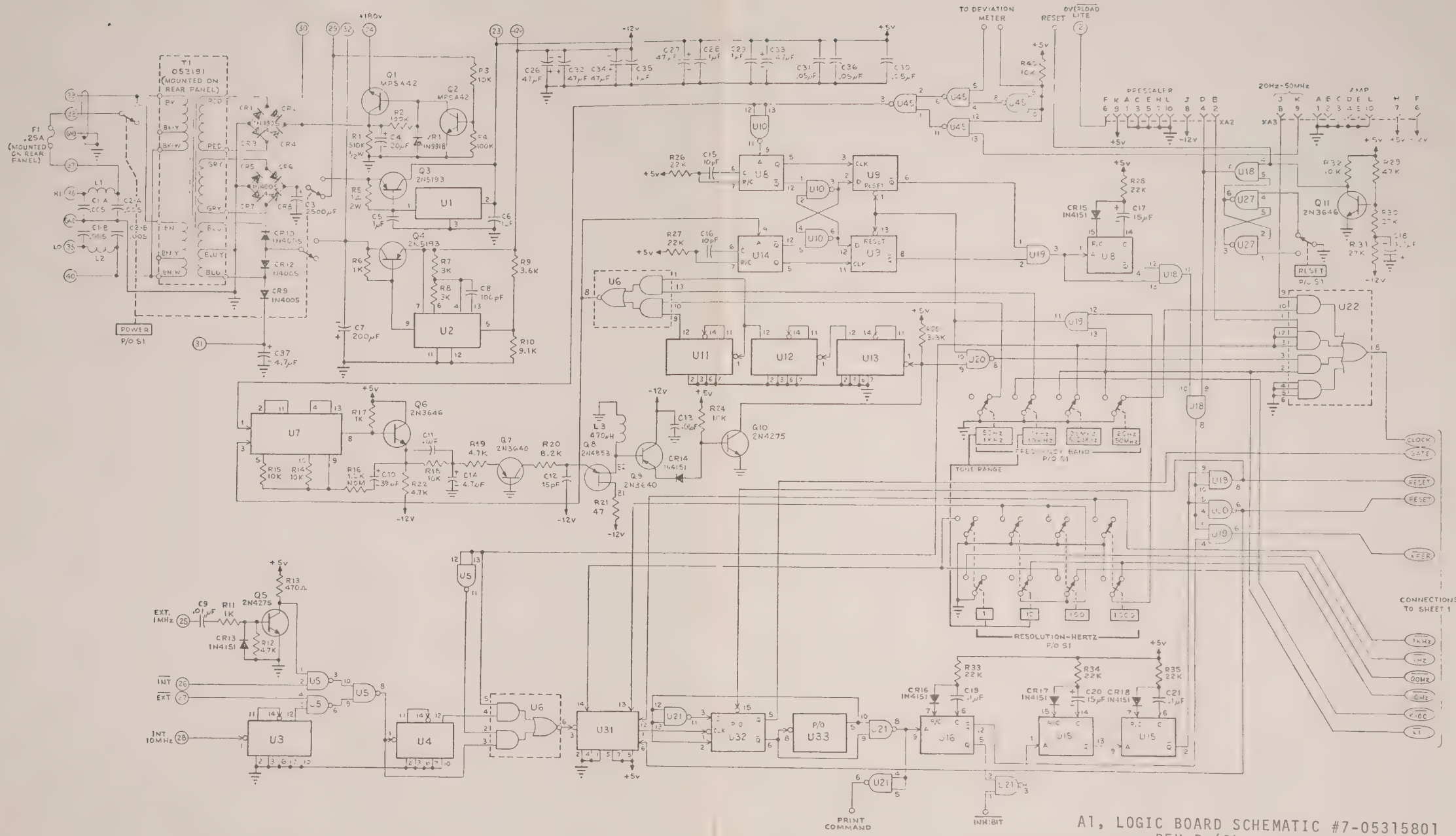
Multiplex is accomplished by the free-running oscillator, U36, clock register, U35, and decoder, U34. The decoder times the sequence of multiplexing and the readout is interlaced multiplex for a proper visual indication.

Off scale is sensed by U20, U25, and U26. The circuit is designed so that U25-9 assumes the same state as U25-5 at each transfer pulse. When the most significant digit carries, U25-5 toggles. This output enables U26-13 and the next transfer pulse toggles U25-9. The gate light drive, for extending the short time base condition, is provided by one-shot, U16, C24. The true gate and extended gate are summed in U17 for proper drive to U26.

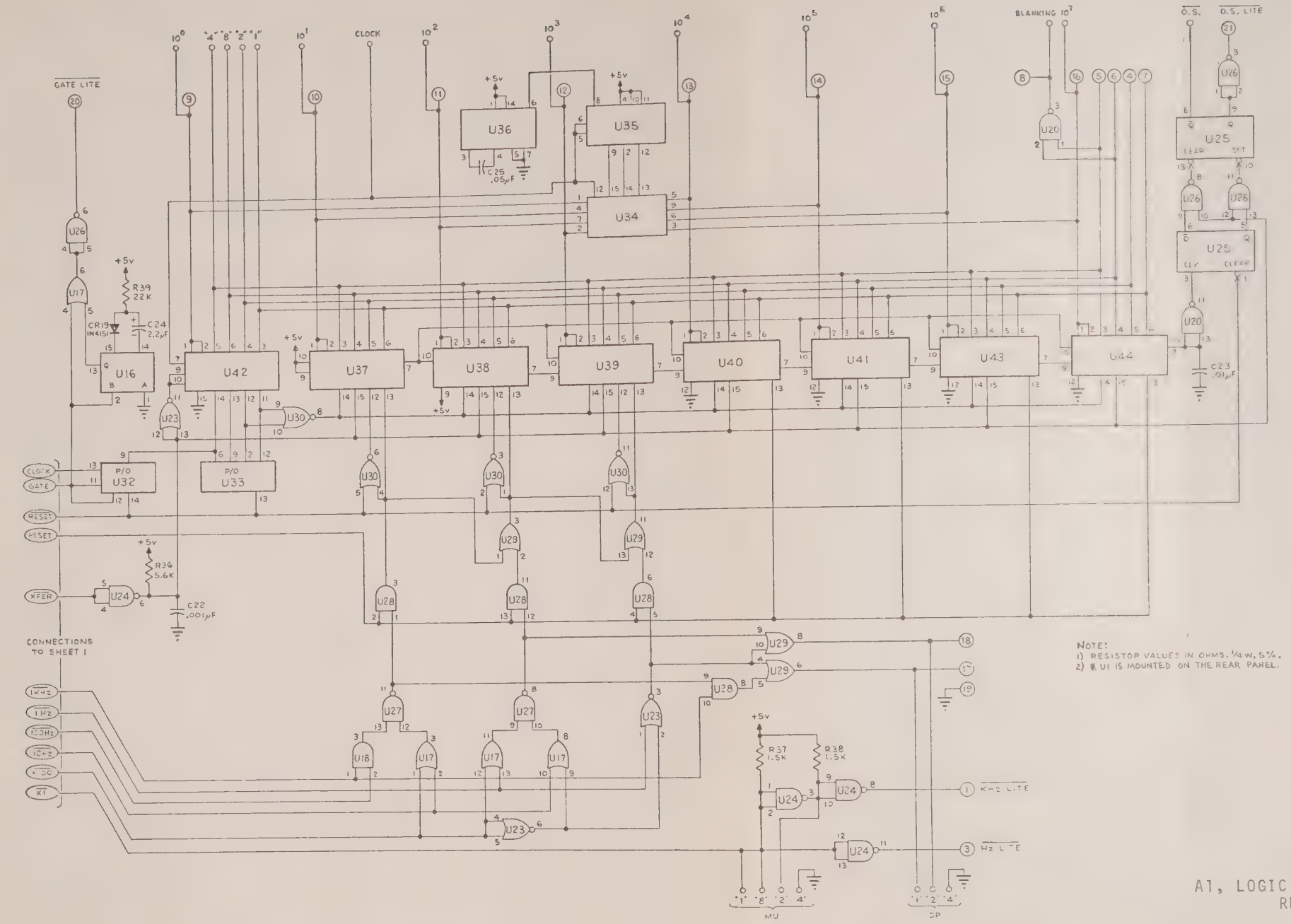
The frequency multiplier is a phase-locked VCO comprised of U14 and attendant circuitry. The output of the amplifier is compared to a submultiple of the VCO frequency in frequency/phase detector, U7. The effective dc output, of U7, is level shifted and filtered, in Q6 and its attendant circuitry, and is applied to FET, Q7. The effective resistance of Q7 is varied by the dc level and, as the resistance varies, the output frequency of the VCO varies. The output frequency of the VCO is divided by decades U11, U12, and U13. If a 1000 multiplication is desired, the output of U11 is coupled through U6, to be compared to the amplifier output in U7. If a 100 multiplication is required, the output of U12 is coupled through U6. U8-5, U14-5, U10-3, U10-6, and U9 comprise a lock-out circuit to prevent the output of the VCO from being counted, if the amplifier output is out of range of the selected frequency band.



A1, LOGIC BOARD ASSEMBLY
#05315801 REV D



A1, LOGIC BOARD SCHEMATIC #7-05315801
REV D (Sheet 1 of 2)



NOTE:
1) RESISTOR VALUES IN OHMS. ¼W, 5%.
2) * U1 IS MOUNTED ON THE REAR PANEL.

		TYPE	+5v	-12v	GND
*	U1	LM309K			
	U2	6A7220			
	U3	SN7490N	5		10
	U4	↓	5		10
	U5	SN74C0N	14		7
	U6	SN7451N	14		7
	U7	MC4044P	14		7
	U8	SN74123N	16		8
	U9	SN7474N	4		7
	U10	SN7400N	4		7
	U11	SN7400N	5		10
	U12	↓	5		10
	U13	↓	5		10
	U14	SN74123N	16		8
	U15	↓	16		8
	U16	↓	16		8
	U17	MC3003P	14		7
	U18	MC3001P	14		7
	U19	↓	14		7
	U20	SN7400N	14		7
	U21	↓	14		7
	U22	SN7442N	16		8
	U23	MC3003P	14		7
	U24	SN7426N	14		7
	U25	SN7474N	14		7
	U26	SN7426N	14		7
	U27	SN7400N	14		7
	U28	MC3001P	14		7
	U29	MC3003P	14		7
		MC3002P	14		7
	U31	MK5009	5	-5	2
	U32	SN74S112N	16		8
	U33	SN74196N	14		7
	U34	SN7442N	16		8
	U35	N8281N	14		7
	U36	MC4024P	14		7
	U37	DM85LS2	16		8
	U38	↓	16		8
	U39	↓	16		8
	U40	↓	16		8
	U41	↓	16		8
	U42	DM85LS1	16		8
	U43	DM85LS2	16		8
	U44	↓	16		8
	U45	SN7400N	14		7

A1, LOGIC BOARD SCHEMATIC #7-05315801
REV D (Sheet 2 of 2)

PARTS LIST

A1, LOGIC ASSEMBLY #05315801

Ref.	Description	SD Part No.
	Logic P.C. Assembly	05315801
	Logic Schematic	7-05315801
C1	Capacitor, .005 µF, 1.4 kV, Dual	03289940
C2	Capacitor, .005 µF, 1.4 kV, Dual	03289940
C3	Capacitor, 2500 µF, 15 V, Ax El	C1148
C4	Capacitor, 20 µF, 350 V, Ax El	C1094
C5	Capacitor, 1µF, 25 V, Disc	C0879
C6	Capacitor, 1 µF, 25 V, Disc	C0879
C7	Capacitor, 200 µF, 16 V, Ax El	03290280
C8	Capacitor, 100 pF, D.M.	C0536
C9	Capacitor, .01 µF, 100 V, Disc	C0556
C10	Capacitor, 39 µF, 10 V, Disc	C0902
C11	Capacitor, .1 µF, 50 V, Disc	C0881
C12	Capacitor, 15 pF, 500 V, D.M.	C0528
C13	Capacitor, .01 µF, 100 V, Disc	C0556
C14	Capacitor, 4.7 µF, 10 V, Tant	C1011
C15	Capacitor, 10 pF, D.M.	C0527
C16	Capacitor, 10 pF, D.M.	C0527
C17	Capacitor, 15 µF, 20 V, Tant	C1031
C18	Capacitor, 4.7 µF, 35 V, Tant	C0406
C19	Capacitor, .1 µF, 50 V, Disc	C0881
C20	Capacitor, 15 µF, 20 V, Tant	C1031
C21	Capacitor, .1 µF, 50 V, Disc	C0881
C22	Capacitor, .001 µF, 1 kV, Disc	C0424
C23	Capacitor, .01 µF, 100 V, Disc	C0556
C24	Capacitor, 2.2 µF, 35 V, Tant	C0546
C25	Capacitor, .05 µF, 12 V, Disc	C0672
C26	Capacitor, 47 µF, 20 V, Tant	C0924
C27	Capacitor, 47 µF, 20 V, Tant	C0924
C28	Capacitor, 1 µF, 25 V, Disc	C0879
C29	Capacitor, 1 µF, 25 V, Disc	C0879
C30	Capacitor, .05 µF, 12 V, Disc	C0672
C31	Capacitor, .05 µF, 12 V, Disc	C0672
C32	Capacitor, 47 µF, 20 V, Tant	C0924
C33	Capacitor, 47 µF, 20 V, Tant	C0924
C34	Capacitor, 47 µF, 20 V, Tant	C0924
C35	Capacitor, 1 µF, 25 V, Disc	C0879
C36	Capacitor, .05 µF, 12 V, Disc	C0672
C37	Capacitor, 4.7 µF, 35 V, Tant	C0406

PARTS LIST

A1, LOGIC ASSEMBLY #05315801 (Cont'd)

Ref.	Description	SD Part No.
CR1	Diode, 1N4005	CR0284
CR2	Diode, 1N4005	CR0284
CR3	Diode, 1N4005	CR0284
CR4	Diode, 1N4005	CR0284
CR5	Diode, 1N4005	CR0284
CR6	Diode, 1N4005	CR0284
CR7	Diode, 1N4005	CR0284
CR8	Diode, 1N4005	CR0284
CR9	Diode, 1N4005	CR0284
CR10	Diode, 1N4005	CR0284
CR11	Not Used	
CR12	Diode, 1N4005	CR0284
CR13	Diode, 1N4151	CR0150
CR14	Diode, 1N4151	CR0150
CR15	Diode, 1N4151	CR0150
CR16	Diode, 1N4151	CR0150
CR17	Diode, 1N4151	CR0150
CR18	Diode, 1N4151	CR0150
CR19	Diode, 1N4151	CR0150
L1	Inductor, (ac line filter)	L0166
L2	Inductor, (ac line filter)	L0166
L3	Inductor, 470 μh	L0157
Q1	Transistor, MPSA42	Q0320
Q2	Transistor, MPSA42	Q0320
Q3	Transistor, P/O Test Assembly	
Q4	Transistor, P/O Test Assembly	
Q5	Transistor, 2N4275	26013140
Q6	Transistor, 2N3646	Q0218
Q7	Transistor, 2N3640	Q0178
Q8	Transistor, 2N4853	Q0249
Q9	Transistor, 2N3640	Q0178
Q10	Transistor, 2N4275	26013140
Q11	Transistor, 2N3646	Q0218
R1	Resistor, 510 k 5%, 1/2 W	R0623
R2	Resistor, 100 k 5%, 1/4 W	R0741
R3	Resistor, 10 k 5%, 1/4 W	R0766
R4	Resistor, 10 k 5%, 1/4 W	R0766
R5	Resistor, 1 Ω 5%, 2 W	R2855

PARTS LIST
A1, LOGIC ASSEMBLY #05315801 (Cont'd)

Ref.	Description	SD Part No.
R6	Resistor, 1 k 5%, 1/4 W	R0765
R7	Resistor, 3 k 5%, 1/4 W	R0711
R8	Resistor, 3 k 5%, 1/4 W	R0711
R9	Resistor, 3.6 k 5% 1/4 W	R0938
R10	Resistor, 9.1 k 5%, 1/4 W	R0776
R11	Resistor, 1 k 5%, 1/4 W	R0765
R12	Resistor, 4.7 k 5%, 1/4 W	R0892
R13	Resistor, 470 Ω 5%, 1/4 W	R1044
R14	Resistor, 10 k 5%, 1/4 W	R0766
R15	Resistor, 10 k 5%, 1/4 W	R0766
R16	Resistor, 2.7 k 5%, 1/4 W, Nom	R0937
R17	Resistor, 1 k 5%, 1/4 W	R0765
R18	Resistor, 10 k 5%, 1/4 W	R0766
R19	Resistor, 4.7 k 5%, 1/4 W	R0892
R20	Resistor, 8.2 k 5%, 1/4 W	R0883
R21	Resistor, 47 Ω 5%, 1/4 W	R0743
R22	Resistor, 4.7 k 5%, 1/4 W	R0892
R23	Not Used	
R24	Resistor, 10 k 5%, 1/4 W	R0766
R25	Resistor, 3.3 k 5%, 1/4 W	R0742
R26	Resistor, 22 k 5%, 1/4 W	R0768
R27	Resistor, 22 k 5%, 1/4 W	R0768
R28	Resistor, 22 k 5%, 1/4 W	R0768
R29	Resistor, 47 k 5%, 1/4 W	R0777
R30	Resistor, 27 k	R0824
R31	Resistor, 27 k	R0824
R32	Resistor, 10 k	R0766
R33	Resistor, 22 k 5%, 1/4 W	R0768
R34	Resistor, 22 k 5%, 1/4 W	R0768
R35	Resistor, 22 k 5%, 1/4 W	R0768
R36	Resistor, 5.6 k 5%, 1/4 W	R0821
R37	Resistor, 1.5 k 5%, 1/4 W	R0783
R38	Resistor, 1.5 k 5%, 1/4 W	R0783
R39	Resistor, 22 k 5%, 1/4 W	R0768
R40	Resistor, 10 k	R0766
S1	Switch Assembly, pushbutton, 10 sta	053199
U1	Integrated Circuit, P/O T. Assembly	
U2	Integrated Circuit, U6A7230	025761

PARTS LIST

A1, LOGIC ASSEMBLY #05315801 (Cont'd)

Ref.	Description	SD Part No.
U3	Integrated Circuit, SN7490N	019711
U4	Integrated Circuit, SN7490N	019711
U5	Integrated Circuit, SN7400N	019705
U6	Integrated Circuit, SN7451N	025707
U7	Integrated Circuit, MC4044P	045238
U8	Integrated Circuit, SN74123N	045209
U9	Integrated Circuit, SN7474N	025241
U10	Integrated Circuit, SN7400N	019705
U11	Integrated Circuit, SN7490N	019711
U12	Integrated Circuit, SN7490N	019711
U13	Integrated Circuit, SN7490N	019711
U14	Integrated Circuit, SN74123N, T.I. only	045260
U15	Integrated Circuit, SN74123N	045209
U16	Integrated Circuit, SN74123N	045209
U17	Integrated Circuit, MC3003P	025767
U18	Integrated Circuit, MC3001P	025740
U19	Integrated Circuit, MC3001P	025740
U20	Integrated Circuit, SN7400N	019705
U21	Integrated Circuit, SN7400N	019705
U22	Integrated Circuit, SN74564N	045222
U23	Integrated Circuit, MC3002P	025739
U24	Integrated Circuit, SN7426N	045252
U25	Integrated Circuit, SN7474N	025241
U26	Integrated Circuit, SN7426N	045252
U27	Integrated Circuit, SN7400N	019705
U28	Integrated Circuit, CM3001P	025740
U29	Integrated Circuit, MC3003P	025767
U30	Integrated Circuit, MC3002P	025739
U31	Integrated Circuit, MK5009	045214
U32	Integrated Circuit, SN74112N	025786
U33	Integrated Circuit, SN74196N	025784
U34	Integrated Circuit, SN7442N	025749
U35	Integrated Circuit, N8281A	025727
U36	Integrated Circuit, MC4024P	045206
U37	Integrated Circuit, DM85L52	045212
U38	Integrated Circuit, DM85L52	045212
U39	Integrated Circuit, DM85L52	045212
U40	Integrated Circuit, DM85L52	045212

PARTS LIST

A1, LOGIC ASSEMBLY #05315801 (Cont'd)

Ref.	Description	SD Part No.
U41	Integrated Circuit, DM85L52	045212
U42	Integrated Circuit, DM85L51	045210
U43	Integrated Circuit, DM85L52	045212
U44	Integrated Circuit, DM85L52	045212
U45	Integrated Circuit, SN7400N	019705
VR1	Diode, 1N991B	CR0395
XA2	PC edge connector, 10 position	J0233
XA3	PC edge connector, 10 position	J0233
	Standoff, 4-40 X 1/8	E0127
	Lug, terminal	E0100
	Lug, terminal	E0191
	Jumper, molded	W0087

CIRCUIT DESCRIPTION
A2, READOUT BOARD ASSEMBLY
SCHEMATIC #45586-7-1

The Readout assembly consists of the following major circuit groups; display readout, display decoder driver, units indicators, decimal decoder driver, off-scale (OS) indicator, and gate indicator.

The display readout includes eight in-line, horizontal tubes of the neon-filled cold-cathode discharge type. As the cathodes are grounded, the elements ionize the gas, thus, producing the numerical display. Current through the tubes is limited by the decoder driver U2.

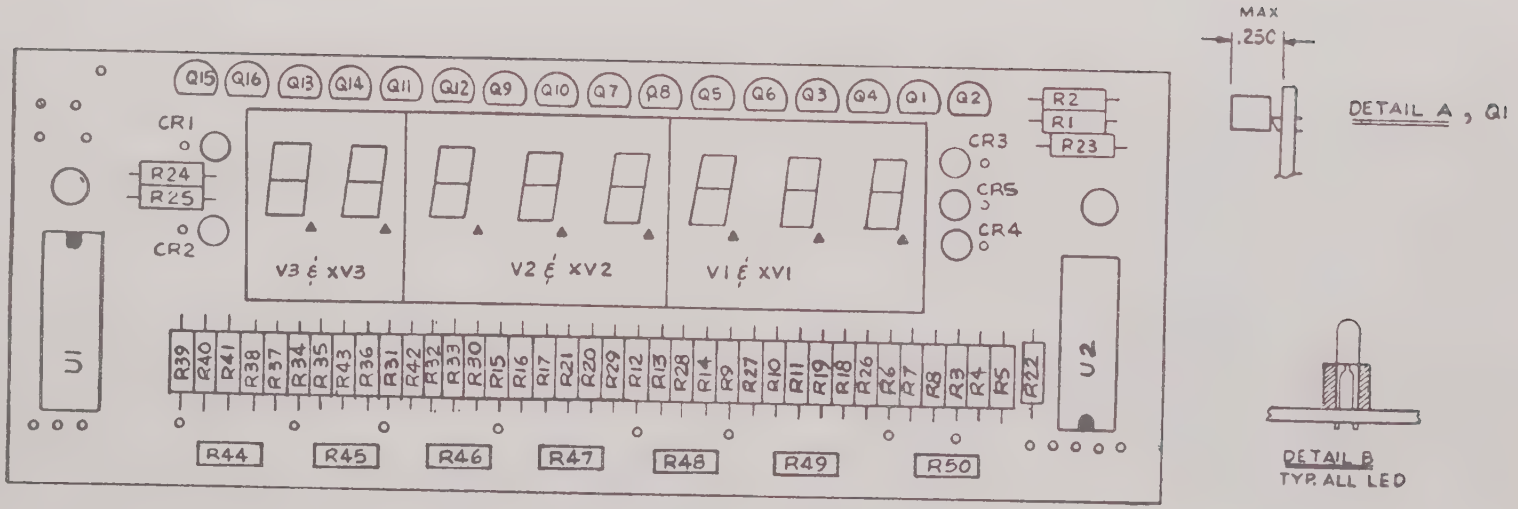
The display decoder driver accepts a binary-coded decimal input and converts the information to an output suitable for grounding the display tube cathodes.

The anodes of the seven segment readout device are activated by a sequenced level, timed to turn the various anodes on, by Q1 through Q16, at a time the cathodes are coded correctly. This multiplexing occurs at a frequency of approximately 2 kHz.

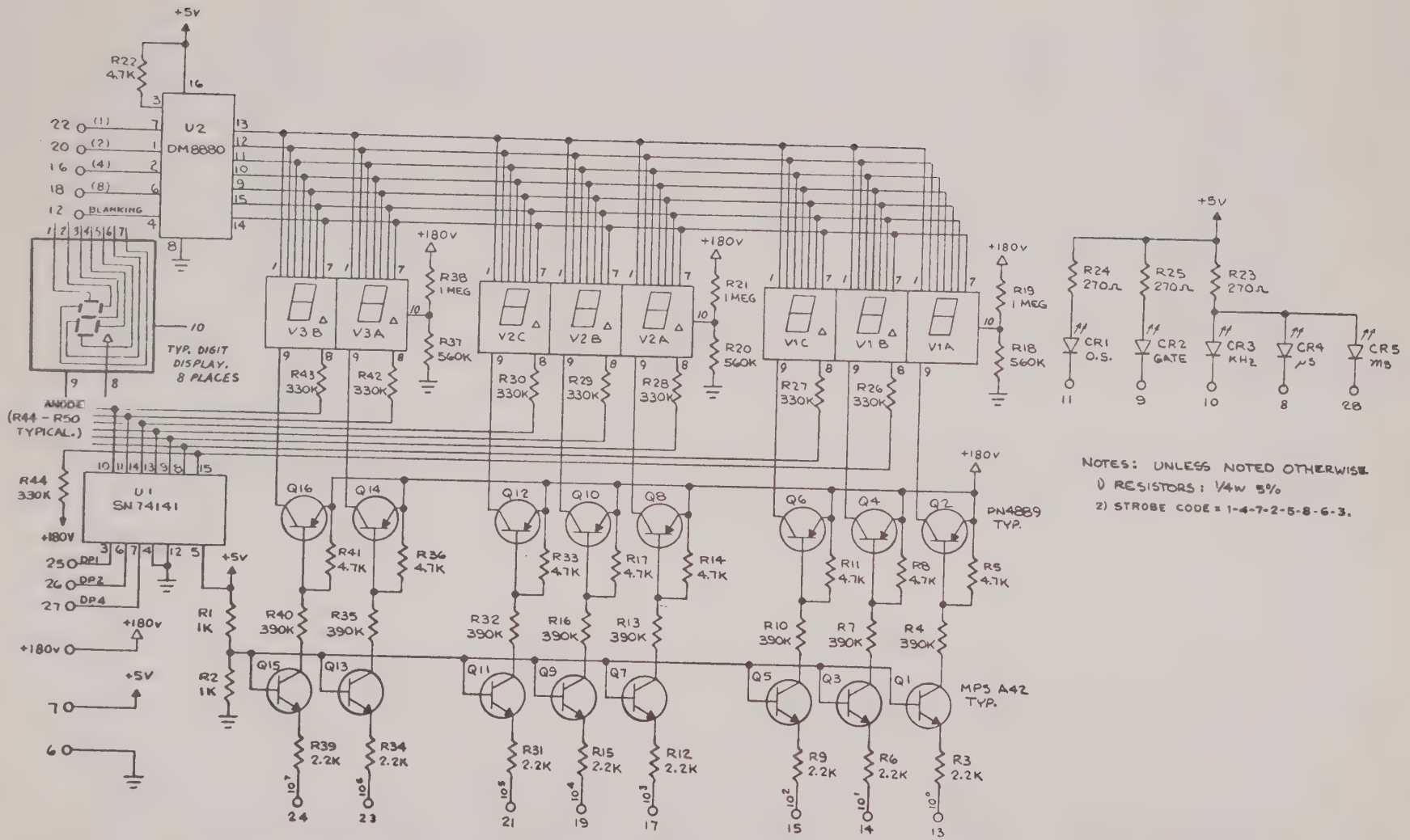
The measurement indicators accept a ground signal from the legend logic and convert it to a visual output of the annunciator unit.

The decimal driver U1 accepts binary-coded decimal information from the decimal logic and converts it to one-of-ten outputs suitable for lighting the decimals contained within the display tubes.

Off-Scale (OS) indication is obtained by sensing the carry output of the last decade in the chain.



A2, READOUT ASSEMBLY #045586-4-1 REV B



NOTES: UNLESS NOTED OTHERWISE

1) RESISTORS: 1/4W 5%

2) STROBE CODE = 1-4-7-2-5-8-6-3.

A2, READOUT SCHEMATIC #045586-7-1 REV B

PARTS LIST

A2, READOUT ASSEMBLY #045586-4-1

Ref.	Description	SD Part No.
	Readout P.C. Assembly	45586-4-1
	Readout Schematic	45586-7-1
CR1	Diode, LED	CR0394
CR2	Diode, LED	CR0394
CR3	Diode, LED	CR0394
CR4	Diode, LED	CR0394
CR5	Diode, LED	CR0394
Q1	Transistor, MPSA42	Q0320
Q2	Transistor, PN4889	Q0321
Q3	Transistor, MPSA42	Q0320
Q4	Transistor, PN4889	Q0321
Q5	Transistor, MPSA42	Q0320
Q6	Transistor, PN4889	Q0321
Q7	Transistor, MPSA42	Q0320
Q8	Transistor, PN4889	Q0321
Q9	Transistor, MPSA42	Q0320
Q10	Transistor, PN4889	Q0321
Q11	Transistor, MPSA42	Q0320
Q12	Transistor, PN4889	Q0321
Q13	Transistor MPSA42	Q0320
Q14	Transistor, PN4889	Q0321
Q15	Transistor, MPSA42	Q0320
Q16	Transistor, PN4889	Q0321
R1	Resistor, 1 k 5%, 1/4 W	R0765
R2	Resistor, 1 k 5%, 1/4 W	R0765
R3	Resistor, 2.2 k 5%, 1/4 W	R0749
R4	Resistor, 390 k 5%, 1/4 W	R1700
R5	Resistor, 4.7 k 5%, 1/4 W	R0892
R6	Resistor, 2.2 k 5%, 1/4 W	R0749
R7	Resistor, 390 k 5%, 1/4 W	R1700
R8	Resistor, 4.7 k 5%, 1/4 W	R0892
R9	Resistor, 2.2 k 5%, 1/4 W	R0749
R10	Resistor, 390 k 5%, 1/4 W	R1700
R11	Resistor, 4.7 k 5%, 1/4 W	R0892
R12	Resistor, 2.2 k 5%, 1/4 W	R0749
R13	Resistor, 390 k 5%, 1/4 W	R1700
R14	Resistor, 4.7 k 5%, 1/4 W	R0892
R15	Resistor, 2.2 k 5%, 1/4 W	R0749

PARTS LIST

A2, READOUT ASSEMBLY #045586-4-1 (Cont'd)

Ref.	Description	SD Part No.
R16	Resistor, 390 k 5%, 1/4 W	R1700
R17	Resistor, 4.7 k 5%, 1/4 W	R0892
R18	Resistor, 560 k 5%, 1/4 W	R1321
R19	Resistor, 1 MEG 5%, 1/4 W	R0962
R20	Resistor, 560 k 5%, 1/4 W	R1321
R21	Resistor, 1 MEG 5%, 1/4 W	R0962
R22	Resistor, 4.7 k 5%, 1/4 W	R0892
R23	Resistor, 270 Ω 5%, 1/4 W	R0694
R24	Resistor, 270 Ω 5%, 1/4 W	R0694
R25	Resistor, 270 Ω 5%, 1/4 W	R0694
R26	Resistor, 330 k 5%, 1/4 W	R1203
R27	Resistor, 330 k 5%, 1/4 W	R1203
R28	Resistor, 330 k 5%, 1/4 W	R1203
R29	Resistor, 330 k 5%, 1/4 W	R1203
R30	Resistor, 330 k 5%, 1/4 W	R1203
R31	Resistor, 2.2 k 5%, 1/4 W	R0749
R32	Resistor, 390 k 5%, 1/4 W	R1700
R33	Resistor, 4.7 k 5%, 1/4 W	R0892
R34	Resistor, 2.2 k 5%, 1/4 W	R0749
R35	Resistor, 390 k 5%, 1/4 W	R1700
R36	Resistor, 4.7 k 5%, 1/4 W	R0892
R37	Resistor, 560 k 5%, 1/4 W	R1321
R38	Resistor, 1 MEG 5%, 1/4 W	R0962
R39	Resistor, 2.2 k 5%, 1/4 W	R0749
R40	Resistor, 390 k 5%, 1/4 W	R1700
R41	Resistor, 4.7 k 5%, 1/4 W	R0892
R42	Resistor, 330 k 5%, 1/4 W	R1203
R43	Resistor, 330 k 5%, 1/4 W	R1203
R44	Resistor, 330 k 5%, 1/4 W	R1203
R45	Resistor, 330 k 5%, 1/4 W	R1203
R46	Resistor, 330 k 5%, 1/4 W	R1203
R47	Resistor, 330 k 5%, 1/4 W	R1203
R48	Resistor, 330 k 5%, 1/4 W	R1203
R49	Resistor, 330 k 5%, 1/4 W	R1203
R50	Resistor, 330 k 5%, 1/4 W	R1203
U1	Integrated Circuit, SN74141	025730
U2	Integrated Circuit, DM8880	045203
V1	Display, 3 digit	V0138

PARTS LIST

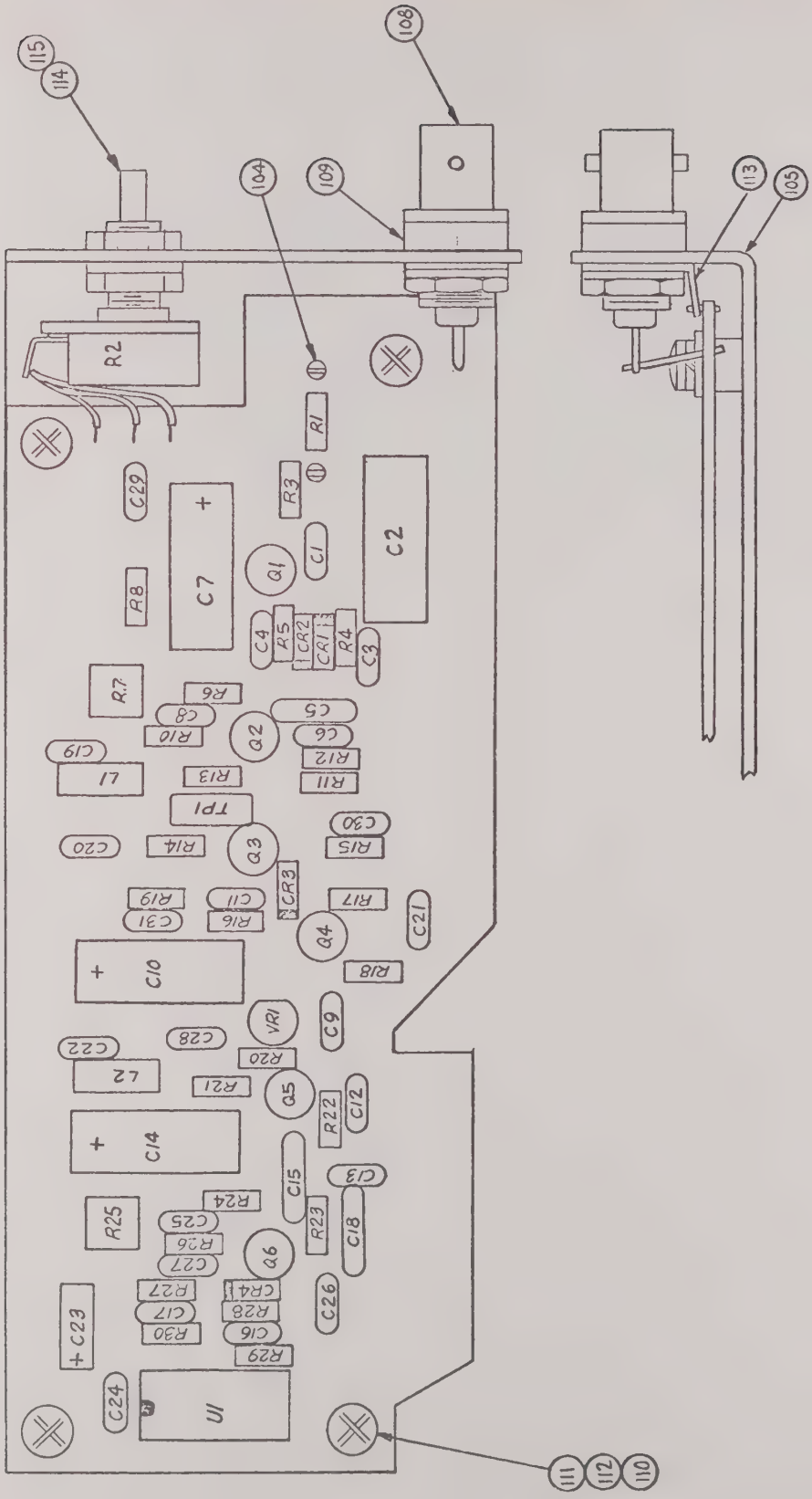
A2, READOUT ASSEMBLY #045586-4-1 (Cont'd)

Ref.	Description	SD Part No.
V2	Display, 3 digit	V0138
V3	Display, 2 digit	V0137
XV1	Socket, display, 3 digit	X0197
XV2	Socket, display, 3 digit	X0197
XV3	Socket, display, 2 digit	X0198

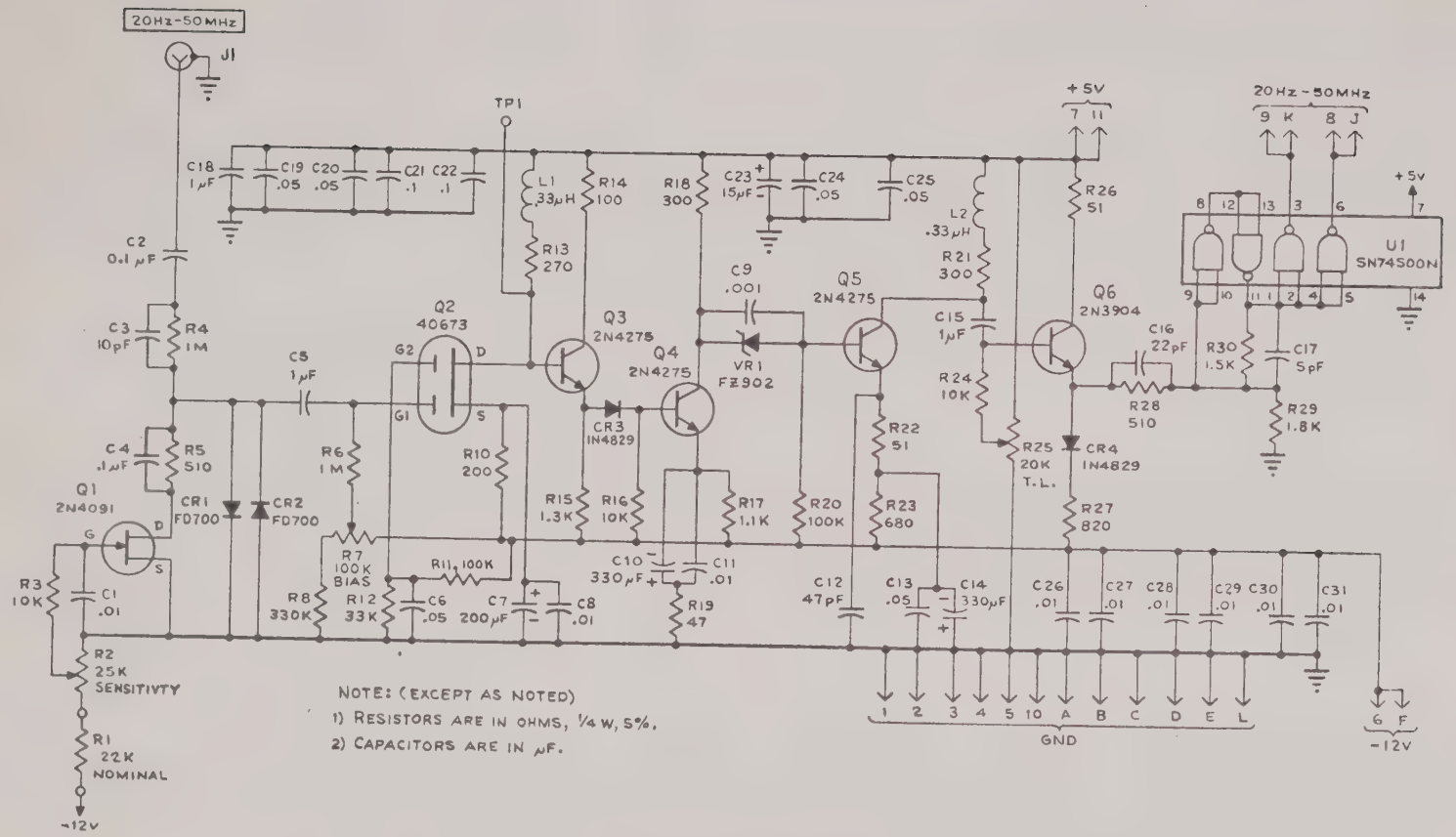
CIRCUIT DESCRIPTION
A3, AMPLIFIER ASSEMBLY
SCHEMATIC #7-05311301

The amplifier consists of a variable attenuator, R4, R5, Q1, an impedance changing circuit, Q2, Q3, a gain circuit, Q4, Q5, Q6, and a shaper, U1, along with associated circuitry for each.

The effective resistance of field-effect-transistor, (FET), Q1 is varied by the sensitivity control, R2. This variable resistance, along with fixed resistors R4, R5, provides the means of varying the signal strength applied to the impedance changing circuit, Q2, Q3, and the associated circuitry. Voltage gain is obtained in Q4, Q5, and current gain in Q6. The operating level of Q6 is varied by the trigger level control, R25, to set the Q6 output level to the input level required by Schmitt trigger, U1-8, U1-11. The outputs of U1-3 and U1-6 are used to drive the 20Hz-50MHz circuitry on the logic board.



A3, AMPLIFIER ASSEMBLY #05311301 REV A



A3, AMPLIFIER SCHEMATIC #05311301 REV A

PARTS LIST

A3, AMPLIFIER ASSEMBLY #05311301

Ref.	Description	SD Part No.
	Amplifier Assembly	05311301
	Amplifier Schematic	7-05311301
C1	Capacitor, .01 µF, 100 V, Disc	C0556
C2	Capacitor, .1 µF, 600 V, Mylar	C0791
C3	Capacitor, 10 pF, D.M.	C0527
C4	Capacitor, .1 µF, 10 V, Disc	C0661
C5	Capacitor, 1 µF, 25 V, Disc	C0879
C6	Capacitor, .05 µF, 50 V, Disc	C0708
C7	Capacitor, 200 µF, 15 V	C0981
C8	Capacitor, .01 µF, 100 V, Disc	C0556
C9	Capacitor, .001 µF, 1 kV	C0424
C10	Capacitor, 330 µF, 6 V	C0929
C11	Capacitor, .01 µF, 100 V, Disc	C0556
C12	Capacitor, 47 pF, D.M.	C0533
C13	Capacitor, .05 µF, 50 V, Disc	C0708
C14	Capacitor, 330 µF, 6 V	C0929
C15	Capacitor, 1 µF, 25 V, Disc	C0879
C16	Capacitor, 22 pF, D.M.	C0529
C17	Capacitor, 5 pF, D.M.	C1071
C18	Capacitor, 1 µF, 25 V, Disc	C0879
C19	Capacitor, .05 µF, 50 V, Disc	C0708
C20	Capacitor, .05 µF, 50 V, Disc	C0708
C21	Capacitor, .1 µF, 10 V, Disc	C0661
C22	Capacitor, .1 µF, 10 V, Disc	C0661
C23	Capacitor, 15 µF, 20 V	C1031
C24	Capacitor, .05 µF, 50 V, Disc	C0708
C25	Capacitor, .05 µF, 50 V, Disc	C0708
C26	Capacitor, .01 µF, 100 V, Disc	C0556
C27	Capacitor, .01 µF, 100 V, Disc	C0556
C28	Capacitor, .01 µF, 100 V, Disc	C0556
C29	Capacitor, .01 µF, 100 V, Disc	C0556
C30	Capacitor, .01 µF, 100 V, Disc	C0556
C31	Capacitor, .01 µF, 100 V, Disc	C0556
CR1	Diode, FD700	CR0356
CR2	Diode, FD700	CR0356
CR3	Diode, 1N4829	CR0364
CR4	Diode, 1N4829	CR0364
L1	Inductor, .33 µH	L0161
L2	Inductor, .33 µH	L0161

PARTS LIST

A3, AMPLIFIER ASSEMBLY #05311301 (Cont'd)

Ref.	Description	SD Part No.
Q1	Transistor, 2N4091	Q0304
Q2	Transistor, 40673	Q0297
Q3	Transistor, 2N4275	26013140
Q4	Transistor, 2N4275	26013140
Q5,	Transistor, 2N4275	26013140
Q6	Transistor, 2N3904	Q0247
R1	Resistor, 22 k 5%, 1/4 W, Nom	Q0768
R2	Resistor, 25 k, potentiometer panel mtg	R2712
R3	Resistor, 10 k 5%, 1/4 W	R0766
R4	Resistor, 1 MEG	R0962
R5	Resistor, 510 Ω	R0984
R6	Resistor, 1 MEG	R0962
R7	Resistor, 100 k 20%, 1/2 W, potentiometer	100027
R8	Resistor, 330 k 5%, 1/4 W	R1203
R9	Not Used	
R10	Resistor, 200 Ω 5%, 1/4 W	R0736
R11	Resistor, 100 k	R0741
R12	Resistor, 33 k	R0780
R13	Resistor, 270 Ω	R0694
R14	Resistor, 100 Ω	R0966
R15	Resistor, 1.3 k	R0737
R16	Resistor, 10 k 5%, 1/4 W	R0766
R17	Resistor, 1.1 k 5%, 1/4 W	R0838
R18	Resistor, 300 Ω	R0670
R19	Resistor, 47 Ω	R0743
R20	Resistor, 100 k	R0741
R21	Resistor, 300 Ω	R0670
R22	Resistor, 51 Ω	R1246
R23	Resistor, 680 Ω	R1234
R24	Resistor, 10 k 5%, 1/4 W	R0766
R25	Resistor, 20 k 20%, 1/2 W, potentiometer	100028
R26	Resistor, 51 Ω	R1246
R27	Resistor, 820 Ω 5%, 1/4 W	R0762
R28	Resistor, 510 Ω	R0984
R29	Resistor, 1.8 k 5%, 1/4 W	R0959
R30	Resistor, 1.5 k	R0783
U1	Integrated Circuit, SN74S00N	025785
TP1	Test Point, brown	E0235

PARTS LIST

A3, AMPLIFIER ASSEMBLY #05311301 (Cont'd)

Ref.	Description	SD Part No.
104	Lug, terminal	E0100
105	Mounting bracket, amplifier	053117
	Nut, weld 4-40	H0390
	Standoff, 4-40 X 1/8	E0127
108	BNC, long shank	J0260
109	BNC spacer, 1/8 thick	045062
110	Screw, 4-40 X 1/4, PHM	H0440
111	Washer, #4 flat	H0758
112	Washer, #4 split	H0782
113	Lug, BNC ground	E0137
114	Nut, 1/4-32	H0531
115	Washer, 1/4 I.D., int tooth	H0742

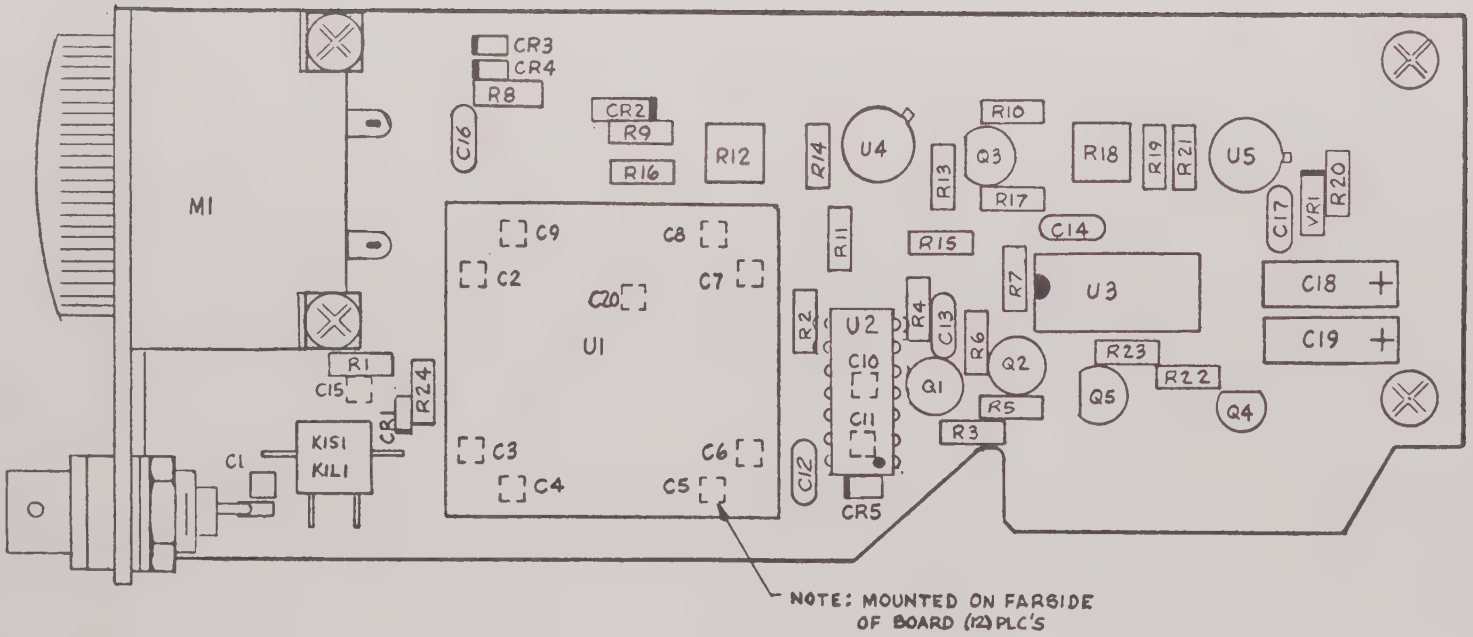
CIRCUIT DESCRIPTION
A4, PRESCALER ASSEMBLY
SCHEMATIC #7-05309001

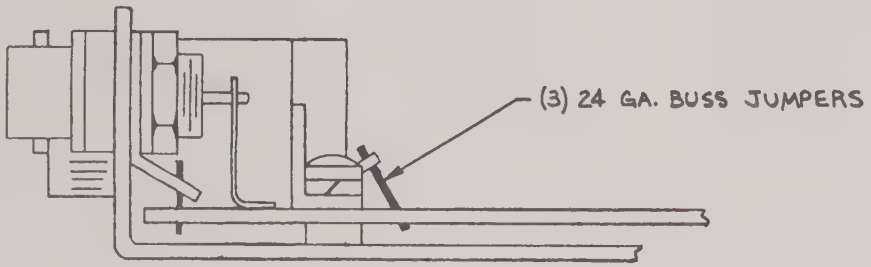
The prescaler consists of a linear amplifier, U1, a scale-of-ten circuit, U2, an amplitude detector/amplifier, CR1, CR2, U4, U3, relay/overload pickoff driver, U5, U3, Q4, Q5, and overload relay, K1.

The input signal is applied through K1S1 to the input of amplifier U1 and detector diode CR1. The output of U1 is applied to the input of U2, scale-of-ten circuit. The output of U2, one-tenth the input frequency, is level converted in Q1, Q2, and applied to buffer U3. The output of U3-3 is counted by the logic board when the 25 MHz-512 MHz frequency band is selected.

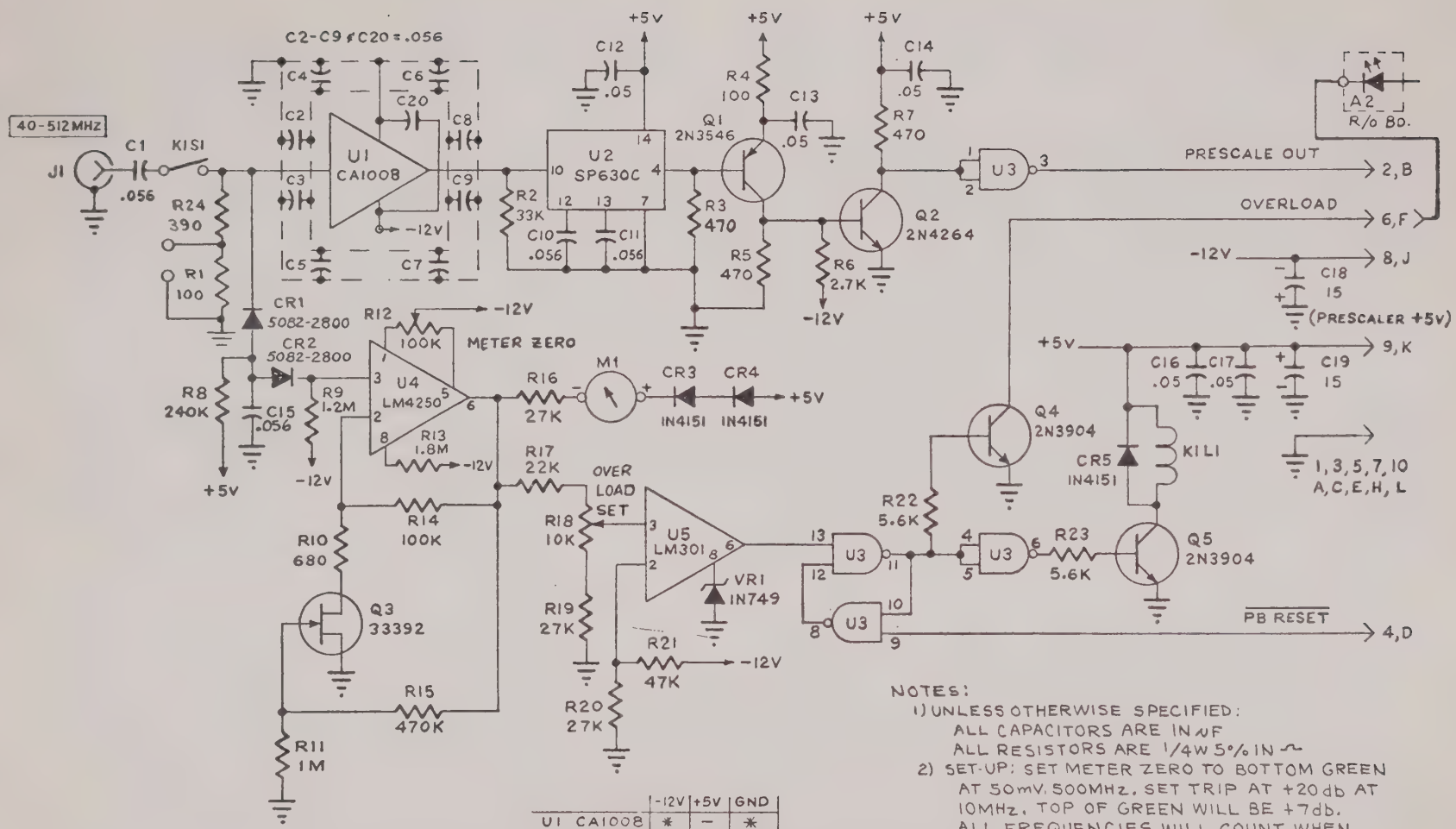
The signal applied to CR1 is rectified and filtered by CR1, CR2, and C15. The resultant dc voltage, proportionate to the input signal amplitude, is applied to amplifier U4. The output of U4 drives the level meter, M1, for a relative indication of input amplitude.

U4 output is also applied to overload amplifier, U5. When the output of U4 reaches a level sufficient to cause differential amplifier, U5, to change state, flip-flop U3-11, U3-8, is triggered. This level, through Q4, and Q5, illuminates the overload lamp and actuates K1 to the open position. Relay K1 remains open until the overload is removed and a reset signal is applied to U3-9.





A4, PRESCALER ASSEMBLY #05309001 REV C



	-12V	+5V	GND
U1 CA1008	*	–	*
U2 SP630B	–	14	7
U3 SN74S00	–	14	7
U4 LM4250	4	7	–
U5 LM301	4	7	–

NOTES:
1) UNLESS OTHERWISE SPECIFIED:
ALL CAPACITORS ARE IN μF
ALL RESISTORS ARE 1/4W 5% IN Ω
2) SET-UP: SET METER ZERO TO BOTTOM GREEN AT 50mV, 500MHz. SET TRIP AT +20db AT 10MHz. TOP OF GREEN WILL BE +7db. ALL FREQUENCIES WILL COUNT WHEN METER IS IN GREEN.

A4, PRESCALER ASSEMBLY #7-05309001 REV C

PARTS LIST

A4, PRESCALER ASSEMBLY #05309001

Ref.	Description	SD Part No.
	Prescaler Assembly	05309001
	Prescaler Schematic	7-05309001
C1	Capacitor, .056 µF, 100 V, Chip	C1164
C2	Capacitor, .056 µF, 100 V, Chip	C1164
C3	Capacitor, .056 µF, 100 V, Chip	C1164
C4	Capacitor, .056 µF, 100 V, Chip	C1164
C5	Capacitor, .056 µF, 100 V, Chip	C1164
C6	Capacitor, .056 µF, 100 V, Chip	C1164
C7	Capacitor, .056 µF, 100 V, Chip	C1164
C8	Capacitor, .056 µF, 100 V, Chip	C1164
C9	Capacitor, .056 µF, 100 V, Chip	C1164
C10	Capacitor, .056 µF, 100 V, Chip	C1164
C11	Capacitor, .056 µF, 100 V, Chip	C1164
C12	Capacitor, .05 µF, 12 V	C0672
C13	Capacitor, .05 µF, 12 V	C0672
C14	Capacitor, .05 µF, 12 V	C0672
C15	Capacitor, 0.056 µF, 100 V, Chip	C1164
C16	Capacitor, .05 µF, 12 V	C0672
C17	Capacitor, .05 µF, 12 V	C0672
C18	Capacitor, 15 µF 10%, 20 V	C1031
C19	Capacitor, 15 µF 10%, 20 V	C1031
C20	Capacitor, .056 µF, 100 V, Chip	C1164
CR1	Diode, 5082-2800	CR0363
CR2	Diode, 5082-2800	CR0363
CR3	Diode, 1N4151	CR0150
CR4	Diode, 1N4151	CR0150
CR5	Diode, 1N4151	CR0150
L1	Coil	L0174
M1	Meter	053011
Q1	Transistor, 2N3546	Q0192
Q2	Transistor, 2N4264	Q0310
Q3	Transistor, 33392	033392
Q4	Transistor, 2N3904	Q0247
Q5	Transistor, 2N3904	Q0247
R1	Resistor, 100 Ω 5%, 1/4 W	R0966
R2	Resistor, 33 k 5%, 1/4 W	R0780
R3	Resistor, 470 Ω 5%, 1/4 W	R1044
R4	Resistor, 100 Ω 5%, 1/4 W	R0966

PARTS LIST

A4, PRESCALER ASSEMBLY #05309001 (Cont'd)

Ref.	Description	SD Part No.
R5	Resistor, 470 Ω 5%, 1/4 W	R0966
R6	Resistor, 2.7 k 5%, 1/4 W	R0937
R7	Resistor, 470 Ω 5%, 1/4 W	R1044
R8	Resistor, 240 k 5%, 1/4 W	R0817
R9	Resistor, 1.2 M 5%, 1/4 W	R1299
R10	Resistor, 680 Ω 5%, 1/4 W	R1234
R11	Resistor, 1 M 5%, 1/4 W	R0962
R12	Resistor, 100 k, 1/2 W, 4T potentiometer	100027
R13	Resistor, 1.8 M 5%, 1/4 W	R1593
R14	Resistor, 100 k 5%, 1/4 W	R0741
R15	Resistor, 470 k 5%, 1/4 W	R1060
R16	Resistor, 27 k 5%, 1/4 W	R0824
R17	Resistor, 22 k 5%, 1/4 W	R0768
R18	Resistor, 10 k, 1/2 W, 4T potentiometer	100026
R19	Resistor, 27 k 5%, 1/4 W	R0824
R20	Resistor, 27 k 5%, 1/4 W	R0824
R21	Resistor, 47 k 5%, 1/4 W	R0777
R22	Resistor, 5.6 k 5%, 1/4 W	R0821
R23	Resistor, 5.6 k 5%, 1/4 W	R0821
R24	Resistor, 390 Ω 5%, 1/4 W	R0880
S1	Switch, reed	S0400
U1	Integrated Circuit, CA1008 (RF Amplifier)	053401
U2	Integrated Circuit, SP630C	045211
U3	Integrated Circuit, SN74S00N	025785
U4	Integrated Circuit, LM4250CH	045258
U5	Integrated Circuit, LM301A	025745
VR1	Diode, 1N749	CR0306
XU2	Socket, Integrated Circuit	J0657
	Transmission line, 50 Ω	053216
	BNC spacer, 1/8 thick	045062
	Mounting bracket, prescaler	053092
	Swage standoff, 4-40 X 1/8	E0127
	Nut, weld 4-40	H0390
	Screw, 4-40 X 1/4, PHM	H0440
	BNC, long shank	H0260
	Lug, BNC ground	E0137
	Washer, #4 flat	H0758

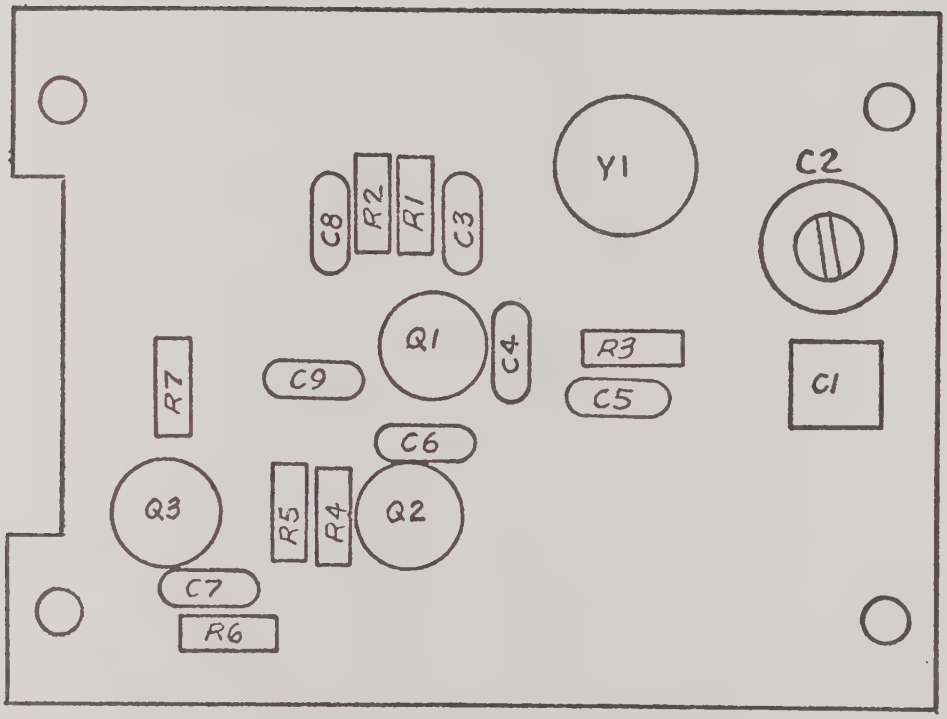
PARTS LIST

A4, PRESCALER ASSEMBLY #05309001 (Cont'd)

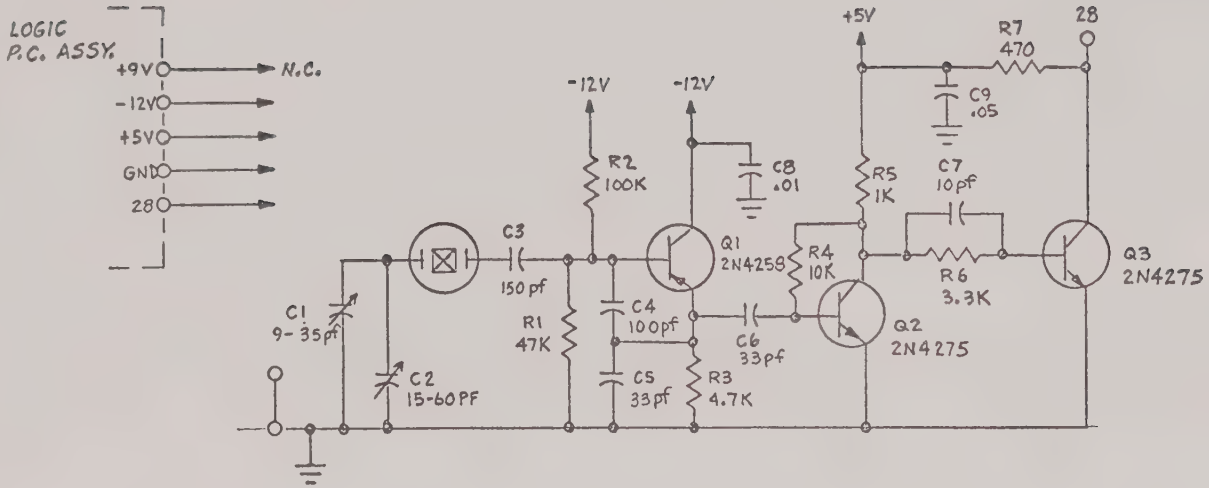
Ref.	Description	SD Part No.
	Washer, #4 split	H0782
	Mounting bracket, meter	053114

CIRCUIT DESCRIPTION
A5, OSCILLATOR ASSEMBLY
SCHEMATIC #7-05318301

The 10 MHz oscillator consists of a quartz crystal controlling a Colpitts circuit. This oscillator provides the standard frequency to which all unknown frequencies are compared. The output can be calibrated to a standard by adjusting the variable capacitor, C2.



A5, OSCILLATOR ASSEMBLY #15318301 REV A



NOTES: UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTORS 1/4 W, 5%.
2. ALL CAPACITORS IN μf.

A5, OSCILLATOR SCHEMATIC #05318301 REV A

PARTS LIST

A5, OSCILLATOR ASSEMBLY #05318301

Ref.	Description	SD Part No.
	Oscillator P.C. Assembly	05308301
	Oscillator Schematic	7-05318301
C1	Capacitor, 9-35 pF, rt angle adj	C0792
C2	Capacitor, 15-60 pF Variable	C1132
C3	Capacitor, 150 pF, D.M.	C1076
C4	Capacitor, 100 pF, D.M.	C0536
C5	Capacitor, 220 pF, D.M.	C0538
C6	Capacitor, 33 pF, D.M.	C0531
C7	Capacitor, 10 pF, D.M.	C0527
C8	Capacitor, .01 µF, 100 V, Disc	C0556
C9	Capacitor, .05 µF, 12 V, Disc	C0672
Q1	Transistor, 2N4258	26004011
Q2	Transistor, 2N4275	26013140
Q3	Transistor, 2N4275	26013140
R1	Resistor, 47 k 5%, 1/4 W	R0777
R2	Resistor, 100 k 5%, 1/4 w	R0741
R3	Resistor, 4.7 k 5%, 1/4 W	R0892
R4	Resistor, 10 k 5%, 1/4 W	R0766
R5	Resistor, 1 k 5%, 1/4 W	R0765
R6	Resistor, 3.3 k 5%, 1/4 W	R0742
R7	Resistor, 470 Ω 5%, 1/4 W	R1044
Y1	Crystal, TO-5	039483

CHAPTER 7
STANDARD OPTIONS

7.1 INTRODUCTION

Included in this chapter are standard options for the Model 6252 Frequency Counter, listed by numerical sequence. Special modifications ordered by the customer may also be included in this chapter. Page numbering consists of the option number followed by the numbered page of that option; i.e.: Option 10, page 5, will be numbered OPT 10-5.

TABLE 7.1 OPTION INDEX INFORMATION

Ref	Description	Dwg #	Page #
OPT 06	Internal Battery Operation	053523	OPT 06/
OPT 07	External Battery Operation	053512	OPT 07-1
OPT 08	Oscillator Temperature Stability	053411	OPT 08-1
OPT 09	Oscillator Temperature Stability	---	---
OPT 11	Oscillator Aging Rate	053513	OPT 11/
OPT 12	Oscillator Aging Rate	053513	OPT 12/
OPT 13	Oscillator Aging Rate	053513	OPT 13-1
--	Rack Mounting	04541003	ACCESSORY-1

CIRCUIT DESCRIPTION
OPTION 06 AND OPTION 07
FINAL ASSEMBLY #053523/#053512

DESCRIPTION

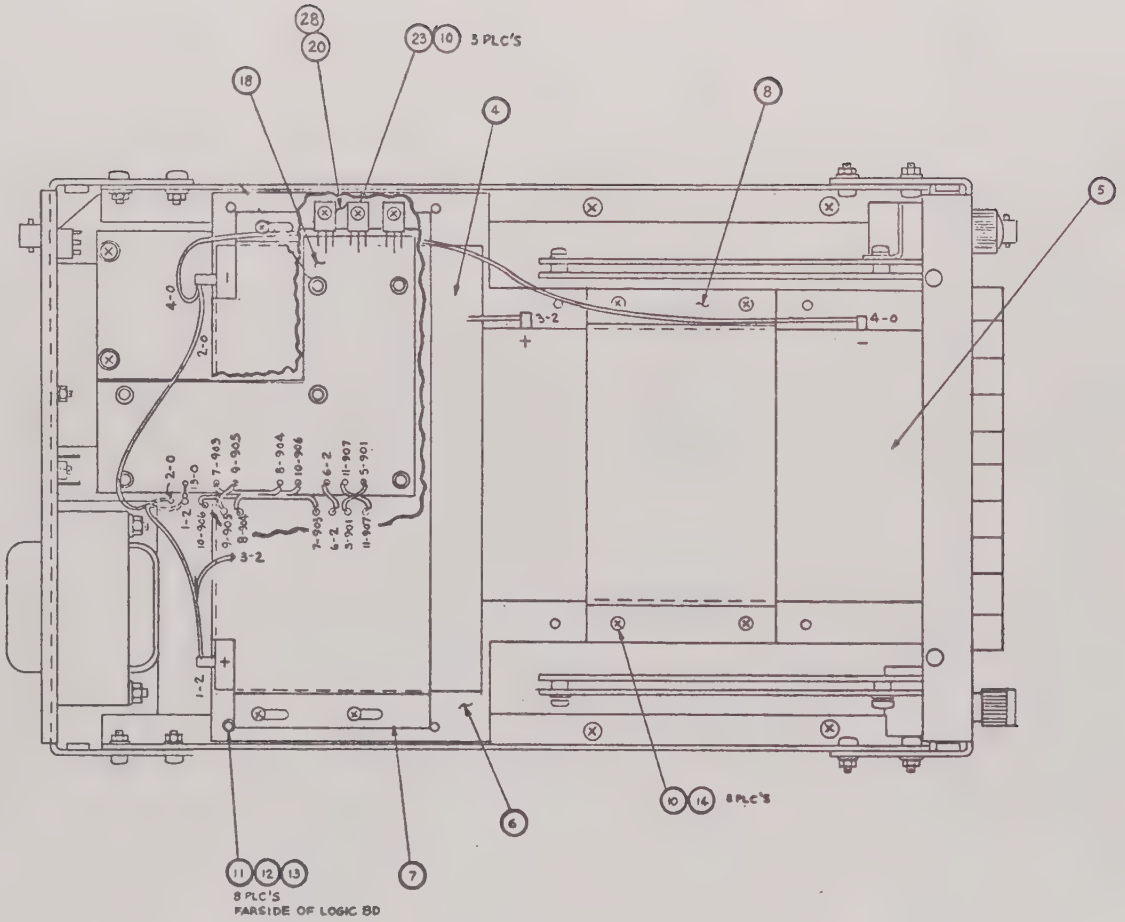
Option 06 provides independent portable operation of approximately four hours from an internal battery pack. An internal battery charger and power inverter circuitry are included in the package.

Option 07 provides portable operation of the Model 6252 with the use of an external battery or 5.5 V to 12 V dc power source. External, banana type, jacks are provided for external connections and power inverter circuitry is provided.

CIRCUIT DESCRIPTION (Schematic #7-05317501)

Power Inverter Assembly, A7, is provided with Option 06 or Option 07. With Option 06 installed, the POWER switch in the OFF position, and the instrument connected to the line voltage, battery charging is provided through Q8, Q2, Q9, Q10, and associated circuitry.

There are two identical independent +5 V dc regulating circuits and a power inverter, U1, which supplies -18 V dc and +180 V dc. The +5 V dc regulators consist of Q1, Q4, Q5, U2, VR2, and Q3, Q6, Q7, U2, and VR3 respectively, and the resistance/capacitance circuitry associated with each. One supplies +5 V dc to the instrument and the other to the power inverter, U1. Operational amplifier, U2, controls the input to the base of Q4 and the collector of Q4 is directly coupled to the base of pass transistor Q1. The output of Q1 is adjustable with potentiometer R15. Q5 is held off for battery operation and shorts the output of U2 when the instrument is connected to line voltage for operation. The other +5 V regulator operates in a like manner.

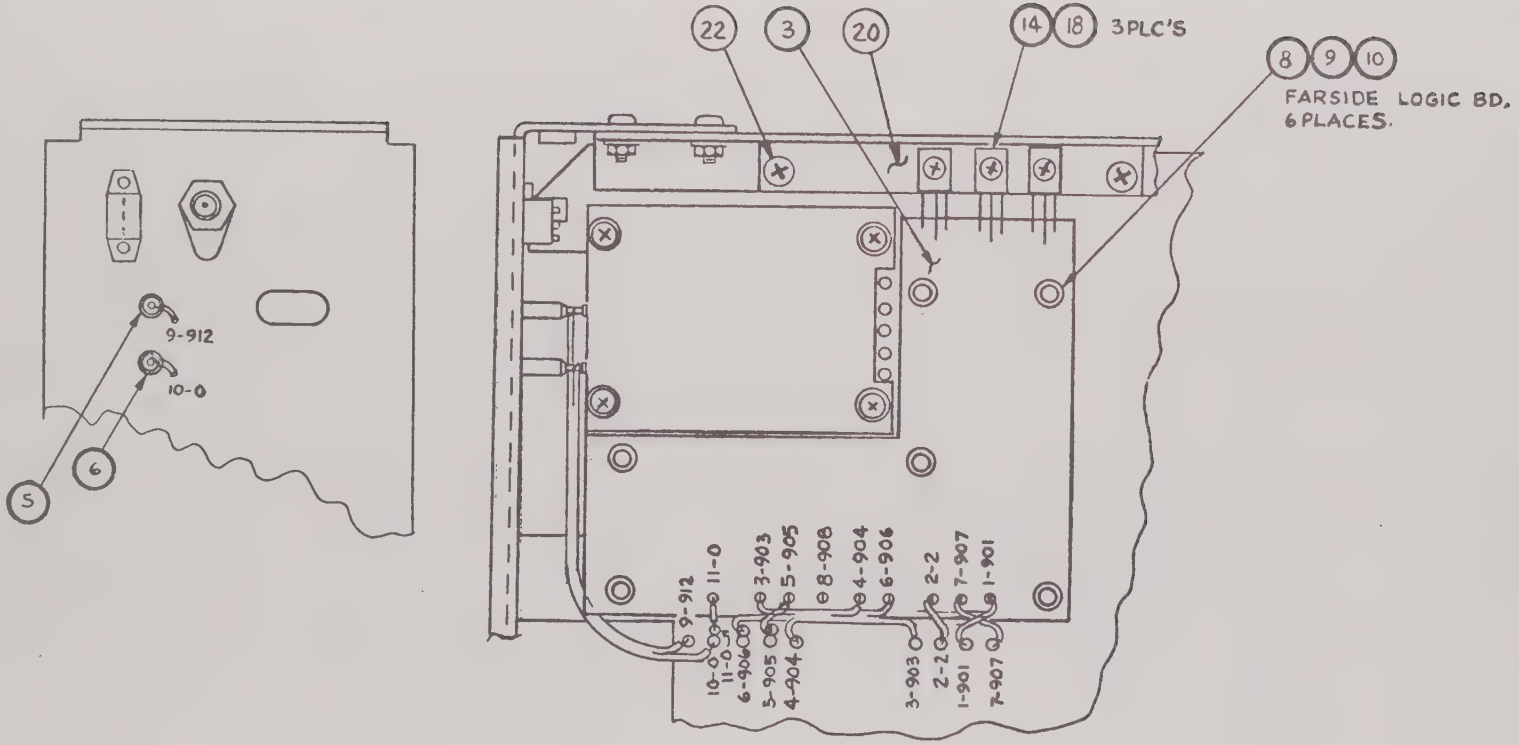


FINAL ASSEMBLY OPTION 06 #053523 REV A

PARTS LIST

FINAL ASSEMBLY OPTION 06 #053523

Ref.	Description	SD Part No.	Qty.
4	Battery	100042	2
5	Battery	100042	
6	Battery, Chassis	053176	1
7	Clamp Assembly, Battery, Front	04561401	1
8	Clamp Assembly, Battery, Rear	04561501	1
9	Not Used		
10	Screw, Pan Head Machine: 4-40 x 5/16	10062605	11
11	Screw, Pan Head Machine: 6-32 x 5/16	10063205	14
12	Washer, #6, Flat	100704	14
13	Washer, #6, Split Lock	100712	14
14	Washer, #4, Split Lock	100711	8
15	Not Used		
16	Not Used		
17	Not Used		
18	Assembly, Power Inverter	05317501	1
19	Not Used		
20	Heatsink, Right	053188	1
21	Not Used		
22	Not Used		
23	Transistor, 2N5193	101405	3
	Transistor, 2N5193	101405	
	Transistor, 2N5193	101405	
24	Not Used		
25	Not Used		
26	Not Used		
27	Not Used		
28	Screw, Pan Head Machine: 6-32 x 3/8	10063206	2

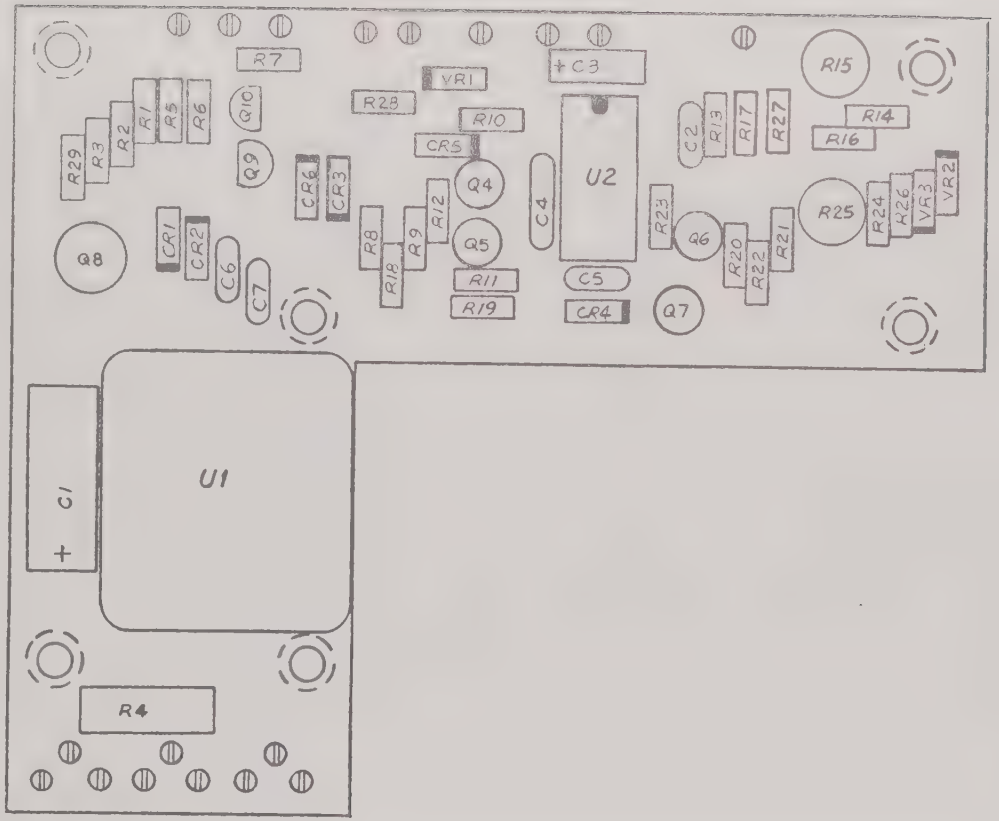


FINAL ASSEMBLY OPTION 07 #053512 REV A

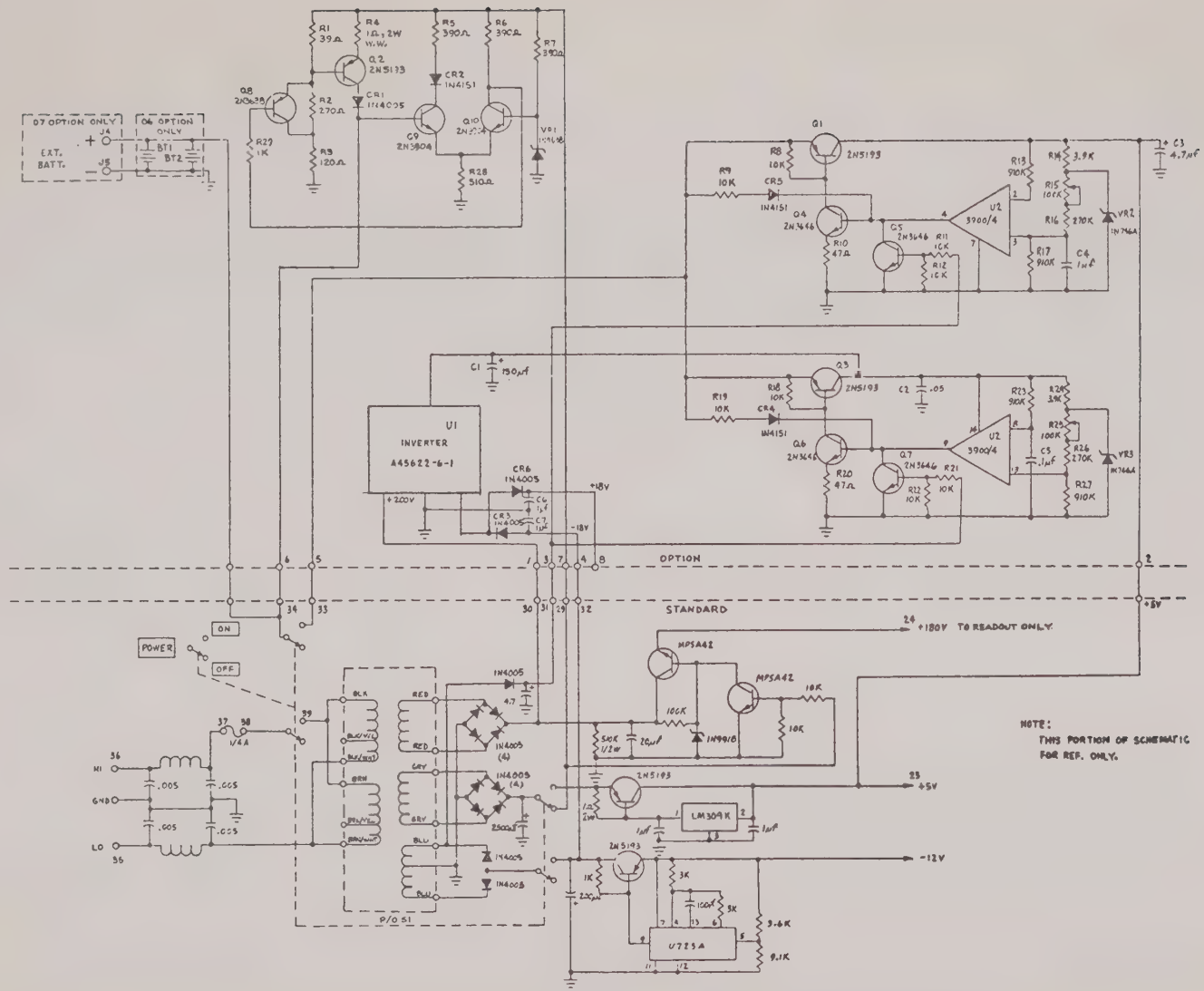
PARTS LIST

FINAL ASSEMBLY OPTION 07 #053512

Ref.	Description	SD Part No.	Qty.
3	Assembly, Power Inverter	05317501	1
4	Not Used		
5	Jack, Banana, Red	101275	1
6	Jack, Banana, Black	101276	1
7	Not Used		
8	Screw, Pan Head Machine: 6-32	10063205	6
9	Washer, #6, Split Lock	100712	6
10	Washer, #6, Flat	100704	6
11	Not Used		
12	Not Used		
13	Not Used		
14	Transistor, 2N5193	101405	3
	Transistor, 2N5193	101405	
	Transistor, 2N5193	101405	
15	Not Used		
16	Not Used		
17	Not Used		
18	Screw, Pan Head Machine: 4-40 x 5/16	10062605	3
19	Not Used		
20	Heatsink, Right	053188	1
21	Not Used		
22	Screw, Pan Head Machine: 6-32 x 3/8	10063206	2



POWER INVERTER ASSEMBLY #05317501 REV A



POWER INVERTER SCHEMATIC #7-05317501 REV A

PARTS LIST
POWER INVERTER ASSEMBLY #05317501

Ref.	Description	SD Part No.	Qty.
	Schematic	7-05317501	
	Artwork	2-053175	
C1	Capacitor, 150 µF, 15 V	100209	1
C2	Capacitor, .05 µF	100122	1
C3	Capacitor, 4.7 µF, 10 V	100205	1
C4	Capacitor, 1 µF, 25 V	100176	3
C5	Capacitor, .1 µF, 10 V, Disc	100120	1
C6	Capacitor, 1 µF, 25 V	100176	
C7	Capacitor, 1 µF, 25 V	100176	
CR1	Diode, 1N4005	100413	3
CR2	Diode, 1N4151	100385	3
CR3	Diode, 1N4005	100413	
CR4	Diode, 1N4151	100385	
CR5	Diode, 1N4151	100385	
CR6	Diode, 1N4005	100413	
Q1	Transistor, 2N5193, P/O Final Assembly	101405	3
Q2	Transistor, 2N5193, P/O Final Assembly	101405	
Q3	Transistor, 2N5193, P/O Final Assembly	101405	
Q4	Transistor, 2N3646	101369	4
Q5	Transistor, 2N3646	101369	
Q6	Transistor, 2N3646	101369	
Q7	Transistor, 2N3646	101369	
Q8	Transistor, 2N3638	101360	1
Q9	Transistor, 2N3904	101377	2
Q10	Transistor, 2N3904	101377	
R1	Resistor, 39 Ω, 5%, 1/4 W	101733	1
R2	Resistor, 270 Ω, 5%, 1/4 W	101542	1
R3	Resistor, 120 Ω, 5%, 1/4 W	101717	1
R4	Resistor, 1 Ω, 5%, 2 W WW	102214	1
R5	Resistor, 390 Ω, 5%, 1/4 W	101592	3
R6	Resistor, 390 Ω, 5%, 1/4 W	101592	
R7	Resistor, 390 Ω, 5%, 1/4 W	101592	
R8	Resistor, 10 k, 5%, 1/4 W	101570	8
R9	Resistor, 10 k, 5%, 1/4 W	101570	
R10	Resistor, 47 Ω, 5%, 1/4 W	101560	2
R11	Resistor, 10 k, 5%, 1/4 W	101570	

PARTS LIST
POWER INVERTER ASSEMBLY #05317501 (Cont'd)

Ref.	Description	SD Part No.	Qty.
R12	Resistor, 10 k, 5%, 1/4 W	101570	
R13	Resistor, 910 k, 5%, 1/4 W	101885	4
R14	Resistor, 3.9 k, 5%, 1/4 W	101601	2
R15	Resistor, 100 k, potentiometer	102298	2
R16	Resistor, 270 k, 5%, 1/4 W	101769	2
R17	Resistor, 910 k, 5%, 1/4 W	101885	
R18	Resistor, 10 k, 5%, 1/4 W	101570	
R19	Resistor, 10 k, 5%, 1/4 W	101570	
R20	Resistor, 47 Ω, 5%, 1/4 W	101560	
R21	Resistor, 10 k, 5%, 1/4 W	101570	
R22	Resistor, 10 k, 5%, 1/4 W	101570	
R23	Resistor, 910 k, 5%, 1/4 W	101885	
R24	Resistor, 3.9 k, 5%, 1/4 W	101601	
R25	Resistor, 100 k, potentiometer	102298	
R26	Resistor, 270 k, 5%, 1/4 W	101769	
R27	Resistor, 910 k, 5%, 1/4 W	101885	
U1	Integrated Circuit, Power Inv.	04562261	1
U2	Integrated Circuit, LM3900	045213	1
VR1	Diode, Zener, 9.1 V	100430	1
VR2	Diode, Zener, 3.3 V	100415	2
VR3	Diode, Zener, 3.3 V	100415	
	Standoff, 6-32 x 1/8	100478	6
	Terminal Lug	100482	18

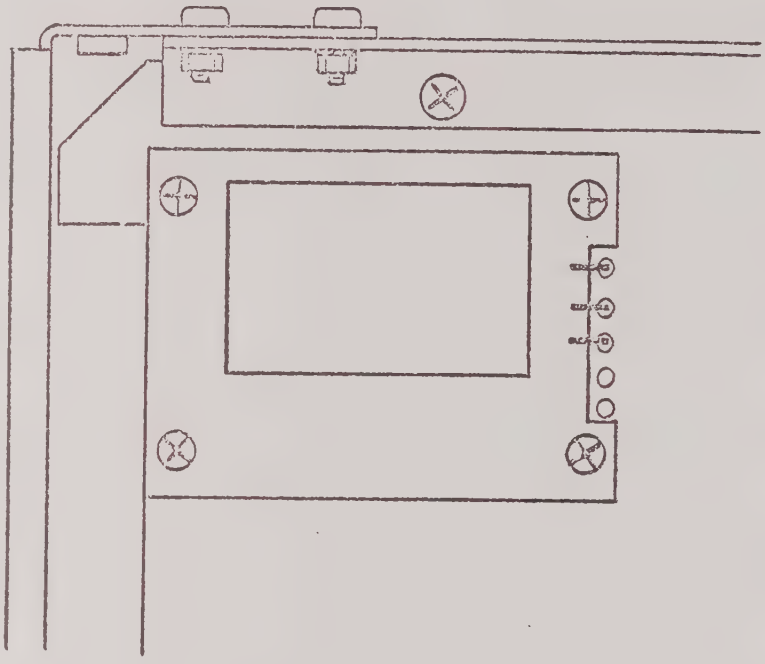
CIRCUIT DESCRIPTION
OPTION 08
OSCILLATOR ASSEMBLY #05318401

08.1 SPECIFICATIONS

Aging Rate:	< ±3 Parts in 10^7/month
Temperature Stability:	±1 part in 10^6 from 0 to 50°C
Line Voltage:	< ±1 part in 10^7 for 10% line variation
External input:	1 MHz at 1 volt rms into 1 kΩ

08.2 PARTS LIST

Ref	Description	S-D Part No.
	ADD	
	Oscillator Option Final Assembly	053411
Y1	Oscillator, 10 MHz	YA0009
	DELETE	
	Oscillator Assembly	05318301
Y1	Crystal, TO-5	039483



NOTES:

1. REMOVE STD. OSC. P.C. ASS'Y. AND DISCONNECT (5) JUMPERS.
2. INSTALL (3) 24 GA. JUMPERS TO 05318401 ASS'Y. AND MOUNT AS SHOWN ABOVE
3. THE EXISTING WHT-RED-GRN WIRE ON THE GND. LUG REMAINS.

OPTION 08 ASSEMBLY #053411 REV A

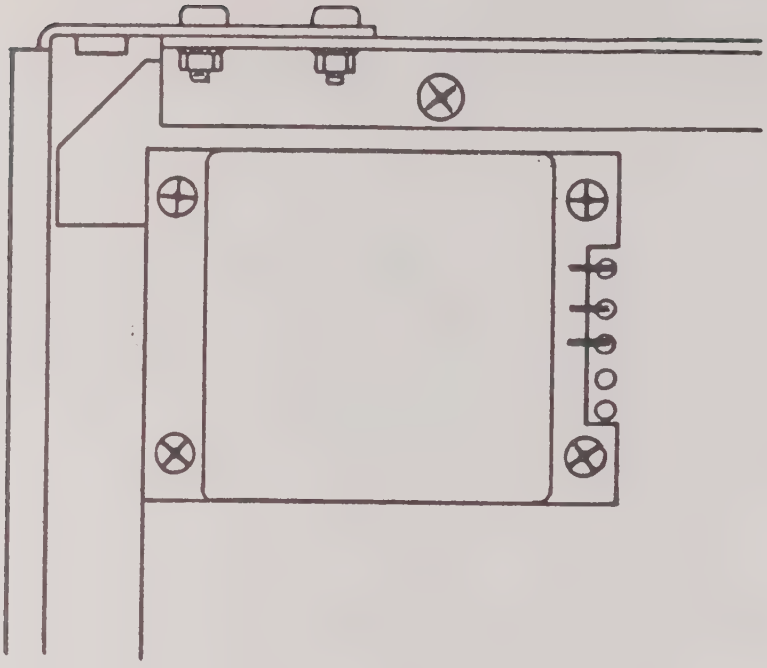
CIRCUIT DESCRIPTION
OPTION 09
OSCILLATOR ASSEMBLY #05318402

09.1 SPECIFICATIONS

Aging Rate	
Long term:	<±3 parts in 10^7/month
Short term:	±1 part in 10^8/day; 3 day average
Temperature Stability:	TCXO. ±1 part in 10^7 over 0° to 50°C
Line voltage:	±1 part in 10^8 for 10% line variation
External input:	1 MHz at 1 V rms into 1 kΩ

08.2 PARTS LIST

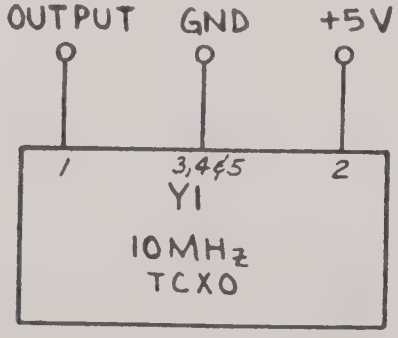
REF.	DESCRIPTION	SD PART NO.
	ADD	
A5	TCXO Oscillator Assembly	05318402
Y1	10 MHz Oscillator	053585
	DELETE	
	Oscillator Assembly	05318301



NOTES:

1. REMOVE STD. OSC. P.C. ASS'Y. AND DISCONNECT (5) JUMPERS.
2. INSTALL (3) 24 GA. JUMPERS TO 05318402 ASS'Y. AND MOUNT AS SHOWN ABOVE
3. THE EXISTING WHT-RED-GRN WIRE ON THE GND. LUG REMAINS.

OPTION 09 TCXO OSCILLATOR ASSEMBLY #053585 REV A



OPTION 09 TCXO OSCILLATOR SCHEMATIC #7-05318402 REV A

CIRCUIT DESCRIPTION
OSCILLATOR OPTION 11, 12, 13
FINAL ASSEMBLY #053513

DESCRIPTION

These Oscillator Options provide higher stability than the standard oscillator. The added assemblies include: U2, 3 MHz Oscillator and A7, Oscillator Control Assembly.

SPECIFICATIONS, OPTION 11

Frequency:	3 MHz
Aging rate after warm-up:	±3 parts in 10^9 per day
Maximum warm-up for "OFF" periods to one week:	72 hours
Frequency retrace for "OFF" periods to 24 hours:	1 hour to reach ±6 x 10^8 maximum
Short term aging rate:	±2 x 10^{10} rms, 1 second
Temperature stability:	<±2 parts in 10^{10}/C° typical ±4 parts in 10^9 over 20°C from 0° to 50°C maximum
Voltage stability:	28 V ±1 V; ±5 x 10^{10} maximum

SPECIFICATIONS, OPTION 12

Frequency:	3 MHz
Aging rate after warm-up:	±1 part in 10^9 per day
Maximum warm-up for "OFF" periods to 1 week:	72 hours
Frequency retrace for "OFF" periods to 24 hours:	1 hour to reach ±6 x 10^8 maximum
Short term aging rate:	1 x 10^{10} rms, 1 second
Voltage stability:	28 V ±2 V; ±5 x 10^{10} maximum
Temperature stability:	<±2 parts in 10^{10}/C° typical

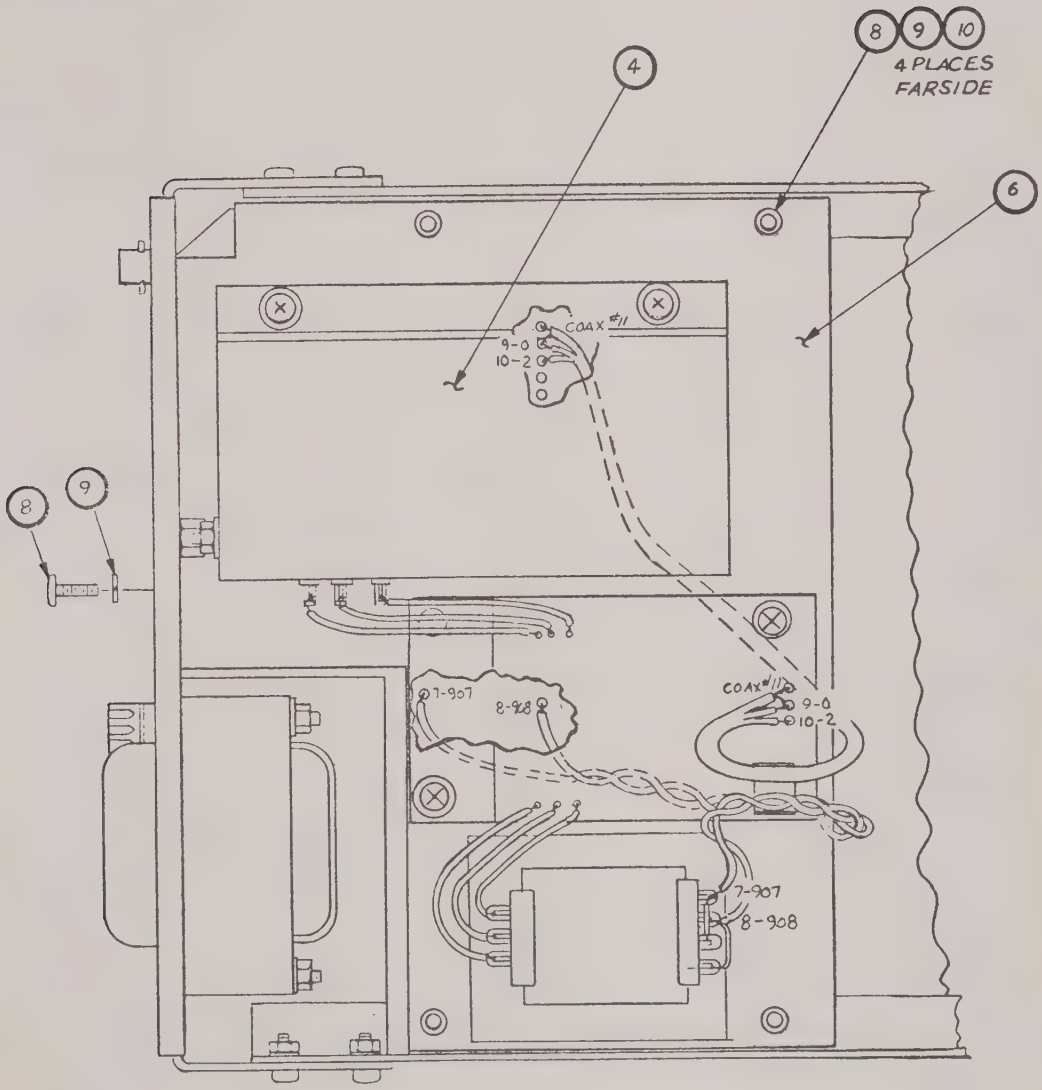
SPECIFICATIONS, OPTION 13

Frequency:	3 MHz
Aging rate after warm-up:	±5 parts in 10^{10} per day
Maximum warm-up for "OFF" periods to 1 week:	72 hours
Frequency retrace for "OFF" periods to 24 hours:	1 hour typical to reach 5 x 10^{9} of turnoff frequency
Short term aging rate:	5 x 10^{11} rms, 1 second
Voltage stability:	28 V ±2 V; ±5 x 10^{10} maximum
Temperature stability:	<±5 parts in 10^{11}/C° typical

CIRCUIT DESCRIPTION (Schematic #7-05318501)

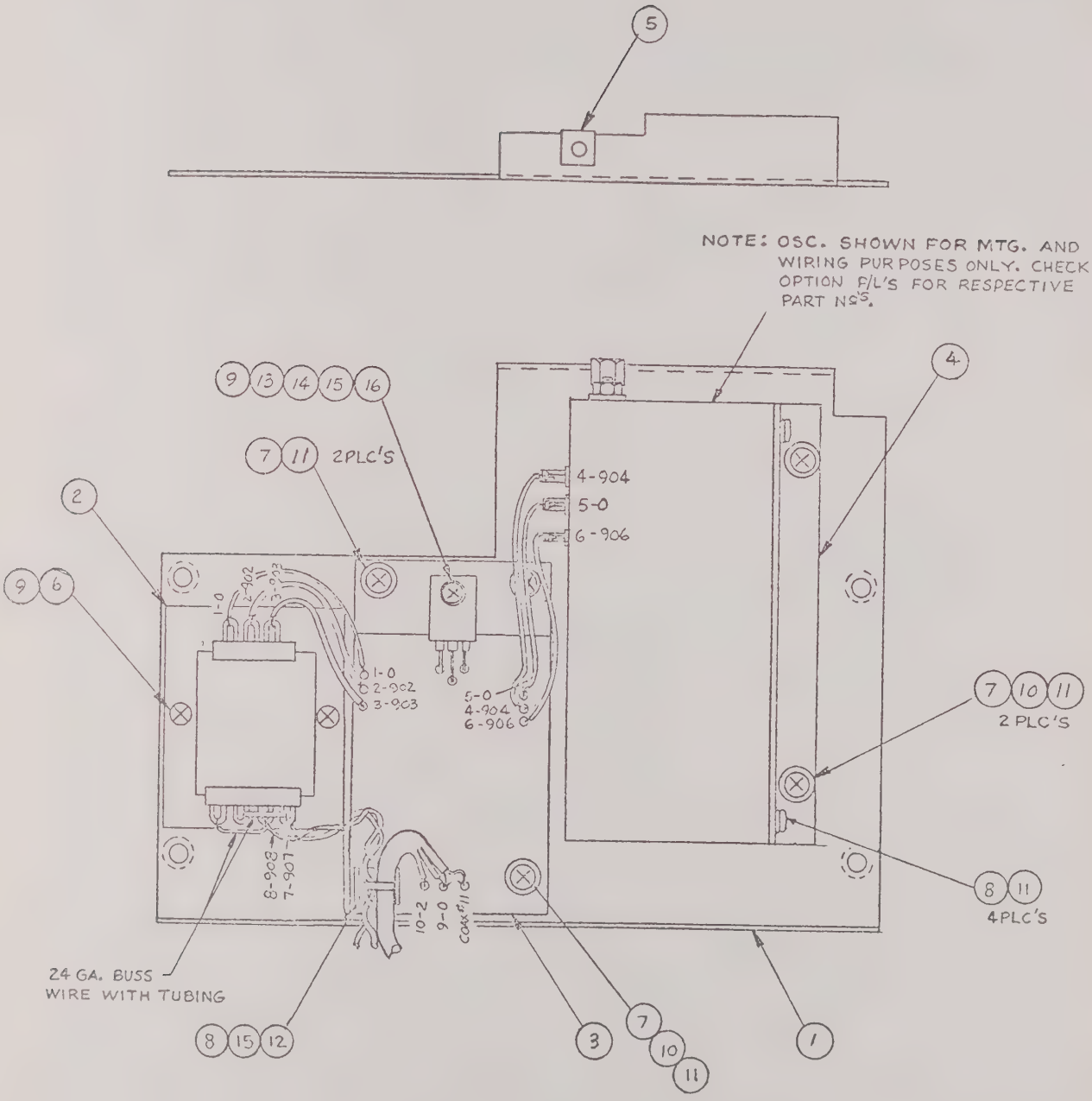
When the instrument power cord is plugged into line voltage, the bridge rectifier provides power to the crystal oven through the 28 V dc regulator, U1. The 3 MHz output of U2 is fed through amplifier Q1 to the dual AND/OR gate U3. The output of U3-8 is fed to U4-3 as a clock signal. U4 is a dual D flip-flop divide-by-three circuit. The 1 MHz output is coupled through A1U5, bypassing A1U3, the divide-by-ten circuit which counts the standard 10 MHz down to 1 MHz.

NOTES: UNLESS OTHERWISE SPECIFIED,
1. SOLDER WIRES TO LOGIC BOARD(A1), BEFORE MOUNTING DOWN CHASSIS ITEM 6.

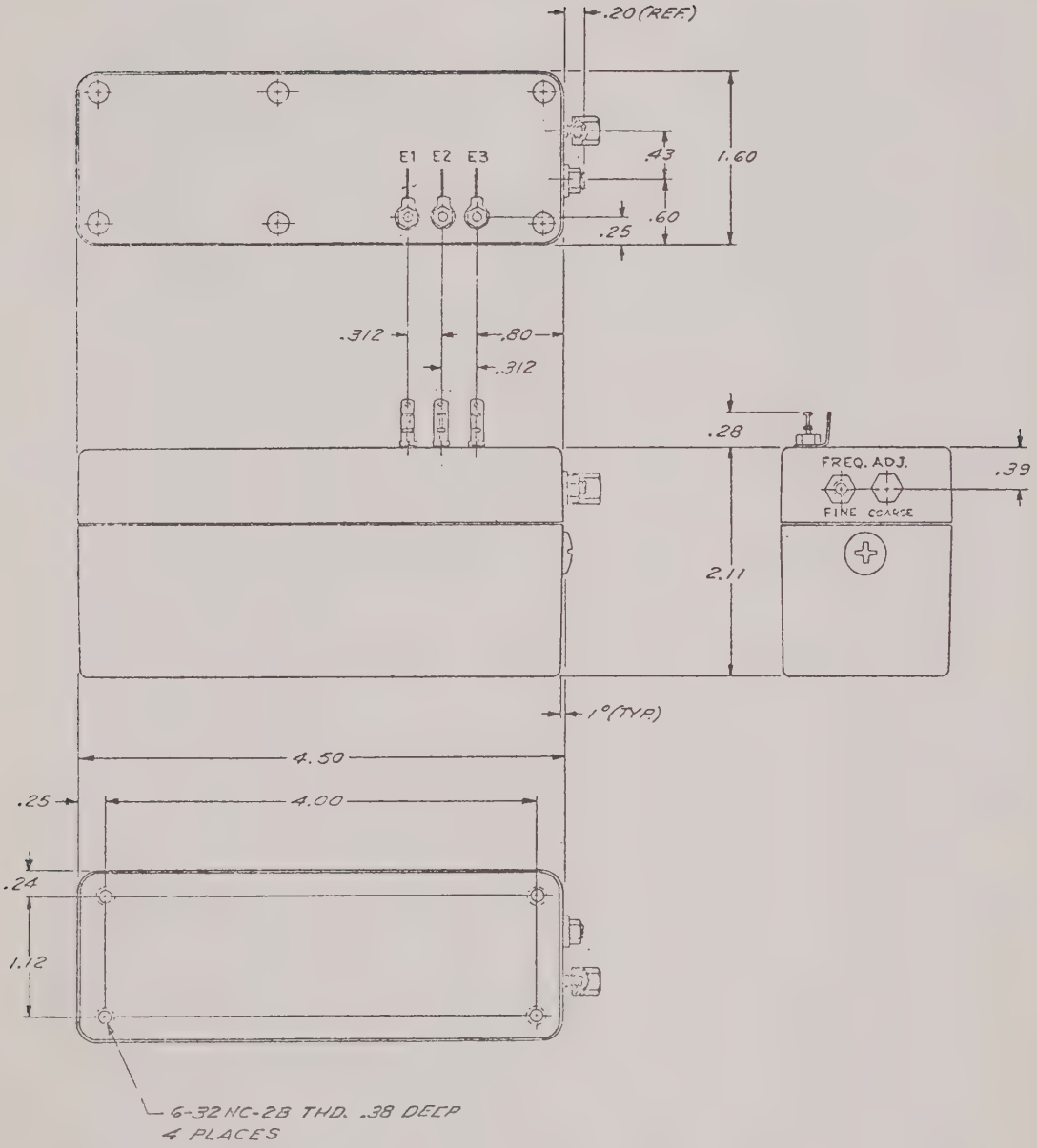


OPTION	FINAL P/L
11	053513
12	053514
13	053515

OSCILLATOR OPTION FINAL ASSEMBLY #053513 REV A



OSCILLATOR CHASSIS ASSEMBLY #05321501 REV A



HIGH STABILITY OSCILLATOR OPTION ASSEMBLY
TYPICAL #33427, #33428, #33429 REV A

PARTS LIST
OSCILLATOR OPTION 11
FINAL ASSEMBLY #053513

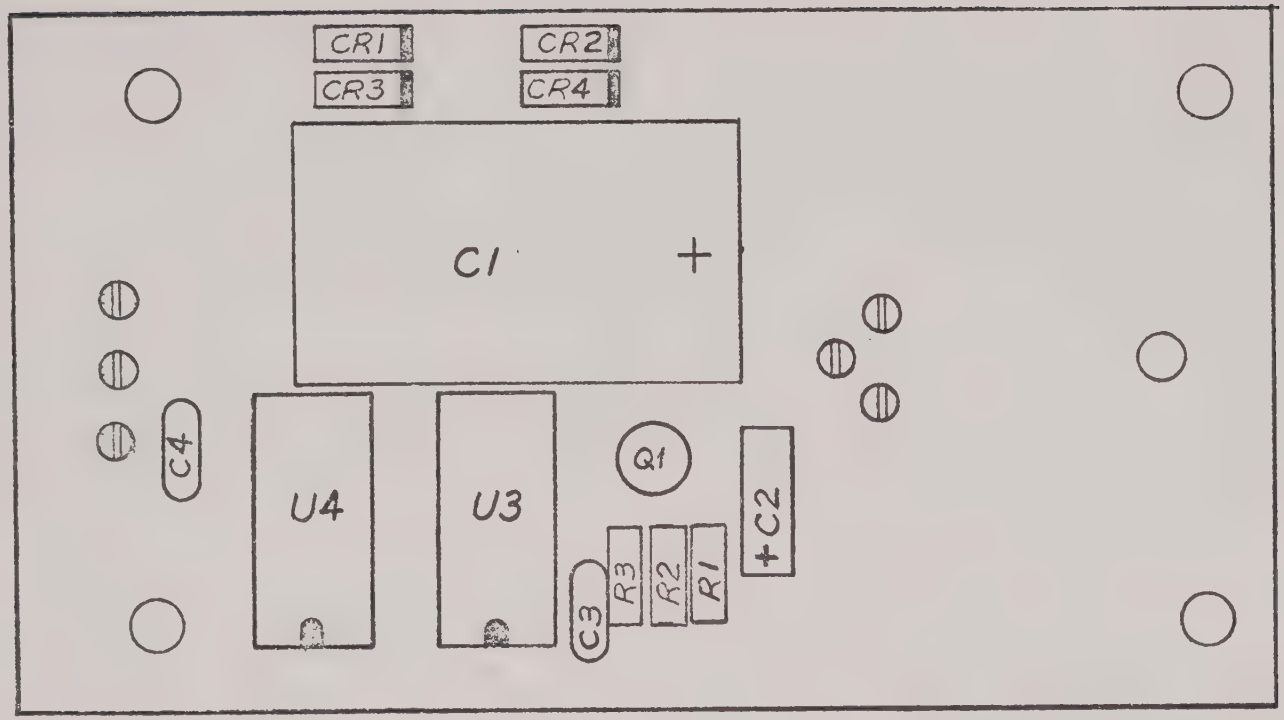
Ref.	Description	SD Part No.	Qty.
	Schematic	7-053185	
A7	Assembly Oscillator Chassis	05321501	1
U2	Oscillator	033428	
	Screw, Pan Head Machine: 6-32 x 3/8	10063206	5
	Washer, #6, Split Lock	100712	5
	Washer, #6, Flat	100704	4
	DELETE		
	Oscillator Cover Plate	02139811	1
A5	Assembly, Oscillator, 10 MHz	05318301	1

PARTS LIST
OSCILLATOR OPTION 12
FINAL ASSEMBLY #053514

Ref.	Description	SD Part No.	Qty.
	Oscillator OPT. 12, Final Assembly	053514	
	Schematic	7-053185	
	ADD		
6,A7	Assembly, Oscillator Chassis	05321501	1
4,U2	Oscillator	033427	1
8	Screw, Pan Head Machine: 6-32 x 3/8	10063206	5
9	Washer, #6, Split Lock	100712	5
10	Washer, #6, Flat	100704	4
	DELETE		
A5	Assembly, Oscillator, 10 MHz	05318301	1
	Oscillator Cover Plate	02139811	1

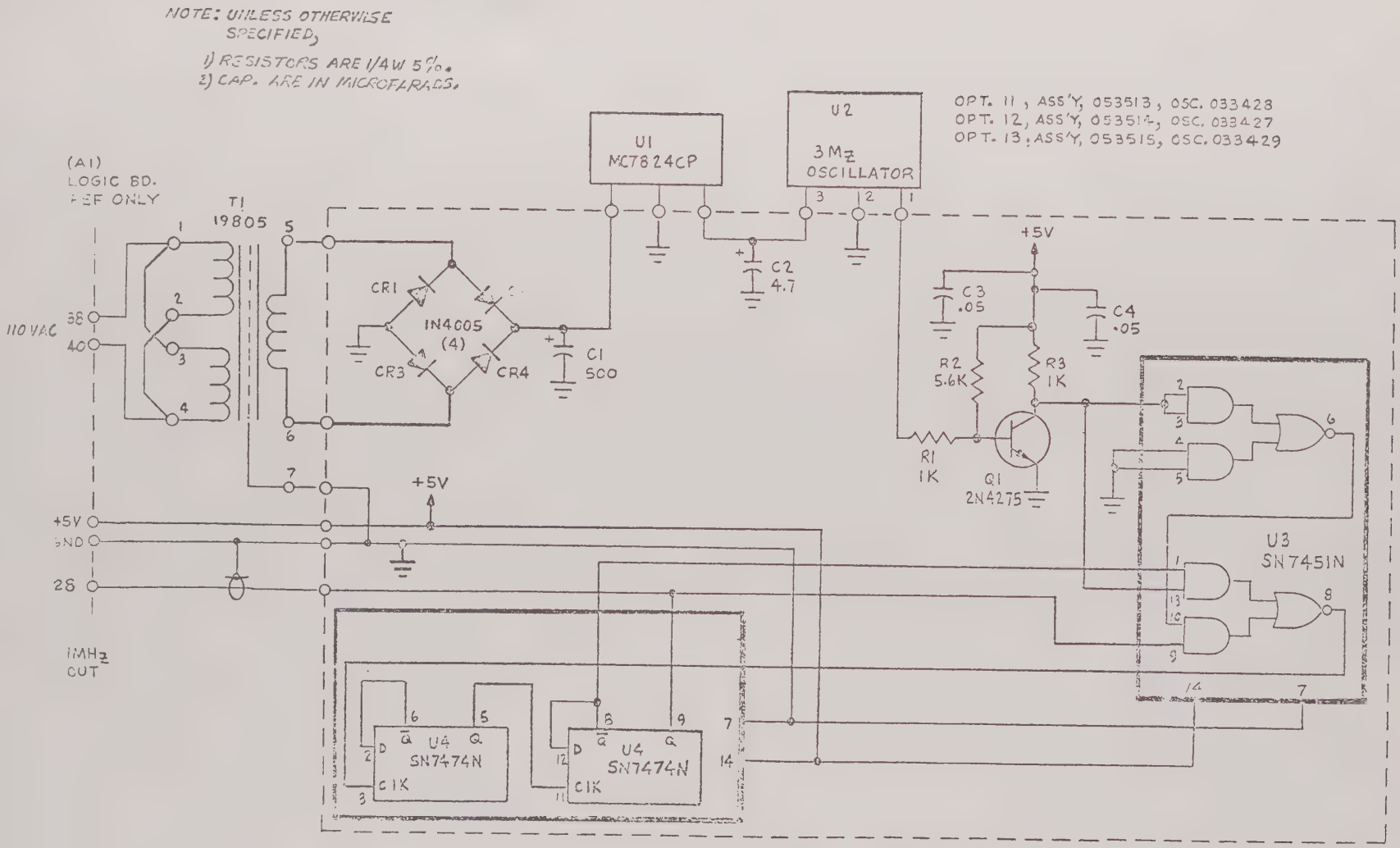
PARTS LIST
OSCILLATOR OPTION 13
FINAL ASSEMBLY #053515

Ref.	Description	SD Part No.	Qty.
	Oscillator OPT. 13, Final Assembly	053513	
	Schematic	7-053185	
	ADD		
6,A7	Assembly, Oscillator Chassis	05321501	1
4,U2	Oscillator	033429	1
8	Screw, Pan Head Machine: 6-32 x 3/8	10063206	5
9	Washer, #6, Split Lock	100712	5
10	Washer, #6, Flat	100704	4
	DELETE		
	Oscillator Cover Plate	02139811	1
A5	Assembly, Oscillator, 10 MHz	05318301	1



A7, OSCILLATOR CONTROL ASSEMBLY #05318501 REV A

OPT 11,12,13-10

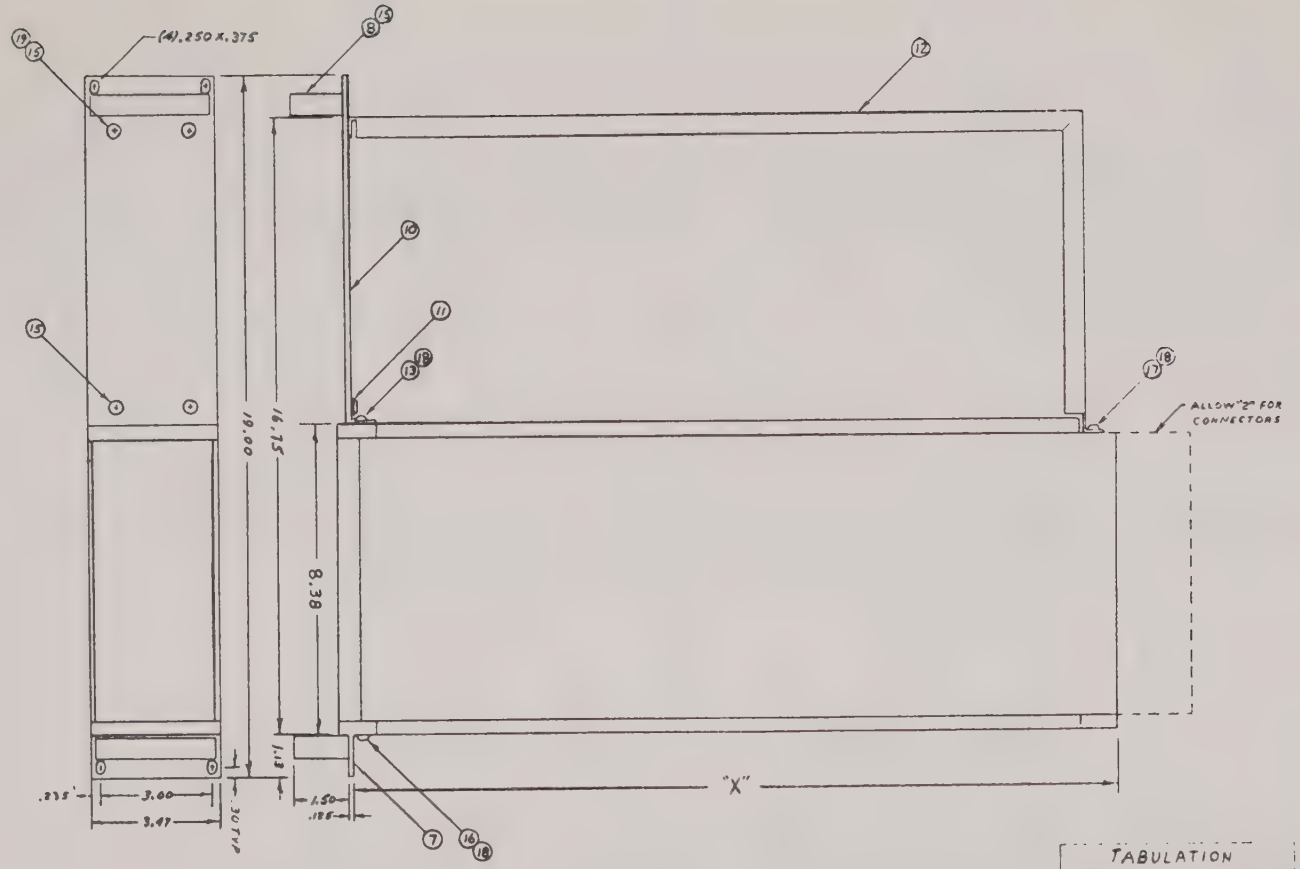


A7, OSCILLATOR CONTROL SCHEMATIC #7-05318501 REV A

053513

PARTS LIST
OSCILLATOR CONTROL ASSEMBLY

Ref.	Description	SD Part No.	Qty.
	Assembly, Oscillator Control	05318501	
	Schematic	7-05318501	
C1	Capacitor, 500 µF, 50 V, El Ax	100296	1
C2	Capacitor, 4.7 µF, 35 V, Tant	100071	1
C3	Capacitor, .05 µF, 12 V, Disc	100122	2
C4	Capacitor, .05 µF, 12 V, Disc	100122	
CR1	Diode, 1N4005	100413	4
CR2	Diode, 1N4005	100413	
CR3	Diode, 1N4005	100413	
CR4	Diode, 1N4005	100413	
Q1	Transistor, 2N4275	102716	1
R1	Resistor, 1 k, 5%, 1/4 W	101569	2
R2	Resistor, 5.6 k, 5%, 1/4 W	101584	1
R3	Resistor, 1 k, 5%, 1/4 W	101569	
U1	P/O Assembly, Chassis		
U2	P/O Assembly, Final		
U3	Integrated Circuit, SN7451N	025707	1
U4	Integrated Circuit, SN7474N	025241	1
	Terminal Lug	100482	6



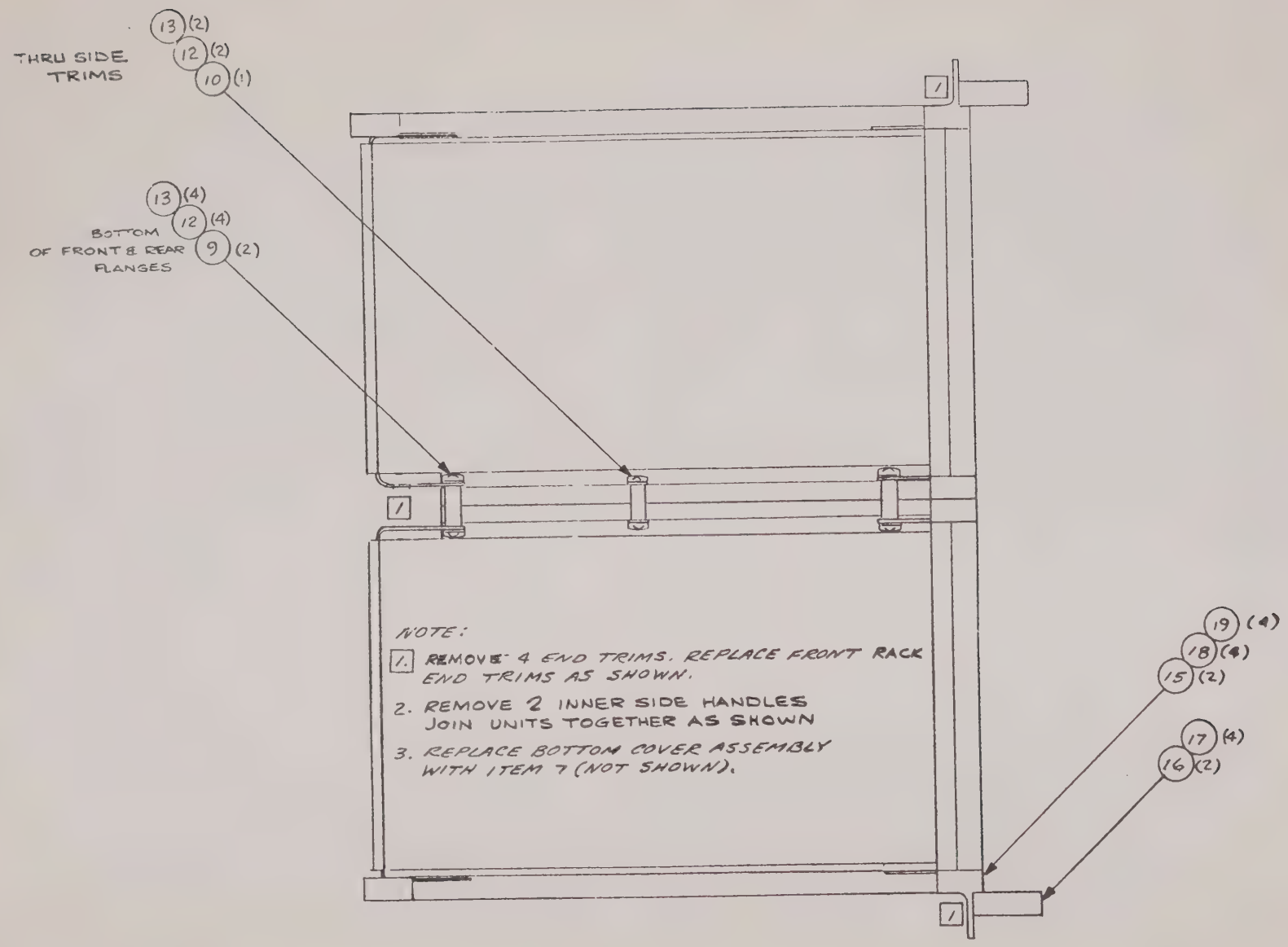
TABULATION		
P/L #	"X"	INSTA. DEPTH
45410-1	8.75	9.12
45410-2	10.75	11.12
45410-3	12.75	13.12
45410-4	14.75	15.12
45410-5	16.75	17.12
45410-6	18.75	19.12
45410-7	20.75	21.12

3 1/2" HALF RACK ASSEMBLY #045410 REV A

PARTS LIST

3 1/2" HALF RACK ASSEMBLY #045410

Ref.	Description	SD Part No.	Qty.
	ADD		
	Assembly/Installation Drawing	045410	
7	Rack Mount, End Trim	045476-2	1
8	Handle	100927	2
9	Not Used		
10	Rack Mounting Panel	039953-2	1
11	Rack Mounting Panel Adapter	039954-2	1
12	Chassis Adapter	045411	1
13	Screw, Pan Head Machine: 8-32 x 5/8	10064210	2
14	Screw, Flat Head Machine: 8-32 x 7/16	10074307	
15	Screw, Flat Head Machine: 8-32 x 3/8	10074306	8
16	Screw, Pan Head Machine: 8-32 x 5/8	10064210	2
17	Screw, Pan Head Machine: 8-32 x 5/16	10064205	2
18	Shake, #8, Int. Tooth	100687	6
19	Nut, 8-32 Kep	100940	2
	DELETE		
	End Trim	033693	2
	Handle	033570	2
	Bail and Foot Assembly	100971	1



DUAL RACK MOUNT ASSEMBLY #032492-3 REV A

PARTS LIST

DUAL RACK MOUNT FINAL ASSEMBLY #037492-3

Ref.	Description	SD Part No.	Qty.
	ADD		
	Assembly	037492-3	
	Cover, Bottom	053050-3	1
9	Spacer, 6-32 x 5/8	100485	2
10	Spacer, 6-32 x 3/4	100977	1
11	Not Used		
12	Screw, Pan Head Machine: 6-32 x 1/4	10063204	6
13	Washer, #6, Split Lock	100712	6
14	Not Used		
15	Rack Mounting, End Trim	45476-2	2
16	Handle	100927	2
17	Screw, Flat Head Machine: 8-32 x 3/8	10074306	8
18	Screw, Pan Head Machine: 8-32 x 5/8	10064210	4
19	Washer, #8, Split Lock	100713	4
	DELETE		
23	Assembly, Bottom Cover	045065-3	1
25	End Trim (2 from Rear, 2 from outside Front)	039033	4
27	Handle	033570-3	2

CHAPTER 8
SUPPLEMENTAL INFORMATION

8.1 INTRODUCTION

This chapter contains revised or updated information reflecting changes in production requirements of this instrument. This information can include changes in assembly/schematic drawings, parts lists, operating instructions, calibration procedures, etc. Changes to parts lists will contain only the added parts, plus a list of deleted items. The supplemental pages for each assembly will be identified with the words SUPPLEMENTAL INFORMATION, followed by the nomenclature of the board. For example, if the Oscillator Board is to be changed, the package identification will read as follows:

SUPPLEMENTAL INFORMATION
A1, LOGIC ASSEMBLY
SCHEMATIC #7-05315801

Page identification for an October 19XX change will be:

6252-X-XX SUPPLEMENT; page numbering will be in numerical order using the same page numbers as the basic information with the addition of an "A". The A1, Logic Assembly supplemental pages will be A1-1A, A1-2A, etc.

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